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OF THE

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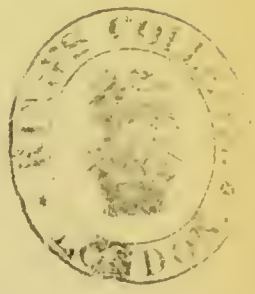
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THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

SECOND EDITION



BY

SIR JAMES PAGET, Bart.,
MEMBER OF THE COUNCIL OF THE COLLEGE,

WITH THE ASSISTANCE OF
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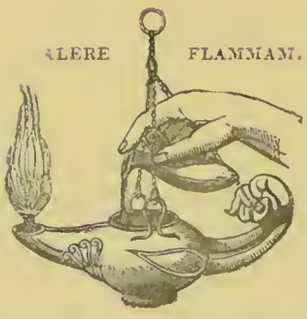
VOLUME II.

MORBID CONDITIONS OF THE BLOOD, THE ORGANS OF MOTION, AND THE SKELETON.

LONDON:
PRINTED FOR THE COLLEGE;
AND SOLD BY
J. & A. CHURCHILL, 11 NEW BURLINGTON STREET.
1883.

484175

Early Schools
R 091.46
PAG



PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

KINGS COLLEGE LONDON

TABLE

OF THE

CONTENTS OF THE SECOND VOLUME.

	Page	Number
Series VII.		
Morbid Conditions of Blood . . .	1	547 to 577
Series VIII.		
Injuries and Diseases of Voluntary Muscles.	17	577A to 588
Series IX.		
Injuries and Diseases of Tendons and Sheaths of Tendons. . .	21	589 to 611
Series X.		
Diseases of Bursæ and Synovial Ganglia	26	612 to 631
Series XI.		
Injuries and Diseases of Cartilage.	30	632 to 648
Series XII.		
Injuries and Diseases of Bone . .	36	649 to 1732
Series XIII.		
Injuries and Diseases of Joints . .	391	1733 to 2018
Series XIV.		
Injuries and Diseases of the Vertebral Column	490	2019 to 2115
Subseries A.		
Distortion of the Pelvis	526	2116 to 2119



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PATHOLOGICAL CATALOGUE.

Division II. SPECIAL PATHOLOGY.

Series VII. MORBID CONDITIONS OF BLOOD.

Clots formed of Blood drawn from the Body: 547 to 551.
Clots formed of Blood in the Heart and Vessels after death: 552 to 555.
Clots formed of Blood effused in the Body during life and variously altered: 556 to 559.
Clots formed of Blood in the Heart and Vessels during life and variously altered: 560 to 577.
- Laminated and Saccular: 560, 561.
- Thrombi, decolorized, &c.: 562 to 564.
- Laminated from Aneurisms: 565 to 568.
- Organized: 568 A; 569?
 (See also 558, 558 A, 558 B, 559.)
- Calcified (Phleboliths): 570.
- Vegetations: 571, 572.
- Embolism and Infarctus: 573 to 577.

Clots formed of Blood drawn from the Body.

547. Section of a clot of blood, covered by a thick "buffy coat" or layer of dense, tough, white fibrinous coagulum. The contraction of the buffy coat has made the clot "cupped"—that is, concave on its upper surface and smaller in circumference at this than at any other part. The outer and inferior portions of the coloured part of the clot are much darker than its interior.

From the Museum of George Langstaff, Esq.

548. A clot of blood with a thin "buffy coat" slightly "cupped."
From the Museum of Sir A. P. Cooper.

549. Section of a similar clot, which also exhibits the concave cup-like depression and, more clearly, the incurved crenated edges of the buffy coat, and the dark exterior of the coloured part of the clot. *From the Museum of Sir A. P. Cooper.*

550. A layer of colourless coagulum, or buffy coat, removed from the upper surface of a clot of blood.
From the Museum of Sir A. P. Cooper.

551. A clot of blood with a thick and contracted buffy coat, to one of the margins of which films and shreds of colourless coagulum are attached. The lower part of the clot has been removed, showing the depth to which the buffy coat extends in it. *From the Museum of Sir A. P. Cooper.*

Clots formed in the Heart and Vessels after Death.

552. A single, continuous and variously branched clot of blood from the right auricle and ventricle and the trunks and branches of the pulmonary artery and venæ cavæ. The impressions of the pulmonary valves are seen on the part of the clot which rested on them. *Hunterian.*

553. A similar clot from the abdominal aorta and its branches, in the same person. *Hunterian.*

"The patient died of palpitations." See p. 8.

554. A finely branched clot of blood from the vessels of a horse.
Hunterian.

555. Section of the right ventricle of a heart, with colourless coagulum, formed after death, adhering to its inner surface and entangled in the meshes of its muscular fasciculi.
Hunterian.

Clots formed of Blood effused in the Body during Life.

556. A clot of blood about fifteen inches long, cylindrical and tortuous. It appears to have been formed in the small intestine; for a part of its surface is marked in circles, as if it had been moulded upon valvulæ conniventes.

Hunterian.

557. Sections of a large firm clot of blood, effused, eleven weeks before death, between the peritoneum and abdominal muscles, from a vessel wounded in *paracentesis abdominis*. It is of uniform firm consistence, and, being partially decolorized, was shaded and mottled with various hues of brown, deep crimson, and black: it is exactly circumscribed and in close contact with the muscle and peritoneum. The epigastric artery and all its branches around the clot were minutely injected, but no injection passed into the substance of the clot. *Presented by John Howship, Esq.*

558. A testicle on the surface of which are two coagula of blood, which are stated by Mr. Hunter to have become partially vascular, and were injected from the blood-vessels of the testicle.

"A man came into St. George's Hospital with an hydrocele, for which he was tapped with a lancet. When the water was evacuated the testicle was larger to the feel than common; and in a month the tunica vaginalis was as much distended as before the operation. The radical cure was now determined upon; the tunica vaginalis was slit open; but the testicle being enlarged, it was thought proper to extract it. Upon the body of the testicle was found a coagulum of blood, resembling a leech in appearance; and in the angle between the testicle and epididymis was another smaller one: at some parts it adhered to the testicle and epididymis, and at others it was loose from both.

"The adhesion of the large coagulum was firm, although it admitted of a separation, which was made at one end; when separated, fibres were plainly seen running between it and the testicle. The adhesions of the small coagulum were in many places still firmer. This blood had been extravasated by the puncture made with the lancet in drawing off the water, and had fallen down upon the testicle, where it coagulated.

"Over the whole surface of the tunica vaginalis there were vessels filled with blood, and clots of extravasated blood in different parts."

The vessels of the testicle were injected; and, when magnified, "the whole surface of the testicle now appeared to be a layer of coagulating lymph become vascular. The surface of adhesion of the larger coagulum was injected for about one twentieth part of an inch, and extremely full of distinct vessels. The smaller coagulum was in many places injected through and through, in others only for a little way along the surface of adhesion."—*Hunter's Works; Description of the Plates* xviii. *and* xix.

A part of one of these coagula with the vessels passing into it is represented, magnified about twelve times, in the 'Philosophical Transactions' for the year 1818, vol. cviii., in pl. xiv., as an illustration of some observations by Sir Everard Home, in his 'Additions to the Croonian Lecture,' p. 193. The same engraving is appended to his 'Lectures on Comparative Anatomy,' vol. iv. tab. vii.

558 A. "A small coagulum of blood, attached by a small neck to the peritoneum, near the fixture of the broad ligament of the liver to the abdomen. When recent, before steeped in water, it had all the appearance of a coagulum of red blood, as if it had coagulated as it oozed out of the mouth of the vessel, something like gum coming out of a tree. This, I conceive, would have become vascular, scirrhous, probably bony, and might have detached itself by some violence, becoming loose, as the above" (alluding to No. 2365).—*Hunterian MS. Catalogue.* *Hunterian.*

558 B. The ovary and part of the Fallopian tube of a Calf. From the tube hangs a pedunculated body resembling the pedunculated coagulum preserved in the preceding specimen; and it was described as such in former catalogues. It is probably one of the pedunculated cysts extremely common in the neighbourhood of the fimbriæ of the tube, hæmorrhage having filled its interior. *Hunterian.*

558 C. "A longitudinal section of the Tendo Achillis of a Dog, broken, and now united by extravasated blood, which is formed into or changed for tendon, similar to the parts which it unites."—*Hunterian MS. Catalogue.*

558 D. The other section of the same tendon. *Hunterian.*

559. Portion of dura mater with a layer of blood, partly decolorized and organized, upon its inner surface. The layer is like one of moderately tough false membrane, pinkish rust-coloured, and intimately adherent to the internal surface of the dura mater.

The effusion of blood was the consequence of injury to the head; but it may be regarded as exhibiting the changes which the blood undergoes when effused in spontaneous apoplexy of the cerebral membranes.

Hunterian.

Clots formed in the Heart and Vessels during Life.

560. A part of the left ventricle of a heart. The whole apex of its cavity is filled by two bodies (*Végétations globuleuses*, Laennec*), of which the larger is nearly two inches in length and an inch in diameter, and the smaller about half that size. At the back of the specimen a section has been made through the wall of the heart into the larger body, and shows its exterior composed of firm fibrinous laminæ, which form an irregular sac containing masses of soft fibrine. The portion of the wall of the ventricle to which this body is attached is rather thinner than natural, and appears soft and dilated.

The following is, probably, the account of the examination of the case:—

"Mr. ——, aged 61, died of apoplexy. On examining the brain I found every thing externally to all appearance sound. On cutting off the upper part of the right hemisphere, I observed in the cortical substance on the right side (just above the middle lobe), where it was surrounding the medullary, and passing in between the convolutions of the medullary substance, that it was redder in its substance than common, full of red dots like cut ends of vessels, many of which were as large as a large pin's head, which were plainly extravasations. The substance, wherever these were, was tender and pulpy, breaking down upon turning off the pia mater, which was not the case with the other parts of the brain that had not this appearance. None of this redness or dottedness was continued into the medullary substance. A very small degree of this appearance was observable on the left side,

* 'Traité de l'Auscultation médiate:' Paris, 1837, t. iii. p. 344.

near about the same place. The ventricles contained about three spoonfuls of water; none in the third or fourth ventricle. The medullary substance over the anterior lobe of the right side was tender, softer, and more ropy than any other part of the brain; it would hardly allow of being cut with the knife.

"On opening the thorax, I found some adhesions of the lungs of the left side; and on cutting into the pericardium, I observed that it adhered to the heart on the left side by a glutinous adhesion, which was easily separated. The heart seemed everywhere sound, excepting one part of the left ventricle: viz., on its fore part, close to the septum, where there was a gentle rising, and a kind of discoloration. On feeling this, there was a plain fluctuation. When I cut into the right ventricle I found the coronary artery, as it passes between the auricle and ventricle, ossified. A large polypus in the right auricle, which extended into the veins, both above and below. This polypus was buff on the upper part through its whole extent, and dark below, which shows its time of forming. The same kind in the ventricle and pulmonary artery. I cut into the left ventricle, where it was sound, to expose its inside; and observed a solid coagulum of blood of an oval figure, opposite to the swelling on the external surface; this coagulum was of old standing from its appearance, and was firmly entangled in the fasciculi of the ventricle. I also could feel a plain fluctuation in it, and which communicated with the external fluctuation. I cut into the swelling externally, and got into a cavity which was in the substance of the heart, and which also communicated with the cavity in the coagulum. These cavities contained a bloody matter.

"The heart at this part must have lost its proper action, which gave an opportunity to the coagulable lymph to coagulate here. An abscess formed in the substance of the ventricle; this abscess came in contact with the polypus, and dissolved part of it, which, mixing with the matter of the abscess, gave it its red colour, but it was prevented from bursting into the cavity of the ventricle by the coagulum.

"The stomach was very much contracted, by its being very empty, from some vomitings he had before death."*—*Hunterian Manuscript; Account of the Dissections of Morbid Bodies*, p. 206.

561. The apex of a heart in which bodies of the same kind as those last described, but smaller and more numerous, are collected among the muscular fasciculi of both ventricles.

* There is so complete a similarity between this case and one published by Mr. Hewson, from Sir John Pringle's notes, that they probably both relate to the same examination. See 'The Works of William Hewson:' edited by George Gulliver, F.R.S.; for the Sydenham Society: London, 1846, p. 165.

The apex of the left ventricle, to the inner surface of which one of the largest bodies is attached, is thin and partially white, from fibroid changes in the muscular tissue.

"*Of the appearances on opening the body of Colonel Graham.*

"On taking off the skull and dura mater we found the cellular membrane of the pia mater everywhere on the upper part of the two hemispheres loaded with a very limpid water. On slicing off the upper part of the two hemispheres, and exposing the two lateral ventricles, we found them fuller of water than what is common in a perfect sound state; and also these cavities larger than common, so that the quantity of water might be three or four ounces, but perfectly clear. Some of the arteries of the pia mater were ossified in some parts, but not remarkably so. Every other part of the brain appeared to be perfectly sound.

"The lungs did not adhere in any part to the pleura excepting at their upper points. They appeared sound everywhere, excepting on the right side, [where] a part on the lower lobe was more dense than common, or even any other part of the same lungs: however, this appeared to be owing only to extravasated water in the cellular membrane of that part. The posterior part of the cavity of the chest on the same side was smeared over with red blood, but we saw no appearance of ruptured vessels. On examining the heart, we found, at the apex of the left ventricle, and for about an inch further on, that the substance was thinner, more flabby than usual, and of a more livid colour. Within the cavity, and near the apex, it was filled up with a substance for a considerable way. The surface of this, next to the cavity of the ventricle and circulating blood, was firm, like coagulating blood of long standing, in the centre of which was half coagulated blood. In many places between the fasciculi near the apex were a number of small bodies, as it were peeping through between them, which were of the same substance with the former.

"Something of the same kind we found in the right ventricle, which showed the nature of the disease better than the left. It would almost seem to be a circumscribed portion of blood entangled in the fasciculi of the ventricle; the outsides of it coagulating whilst the centre kept almost fluid, which formed a kind of cavity. The external surfaces of all of them were smooth and white, as if washed clean of the red blood, by the motion of the circulating blood. Perhaps after they were once formed, they accumulated by attaching the coagulable part of the blood as it was passing in and out of the heart. But how the blood could stagnate at the first is not easily explained; or was it an exudation of the coagulable lymph, as we find in other cavities, and even in the veins, where the blood is also in motion?

"The abdominal viscera appeared to be tolerably sound."—*Hunterian Manuscript; Account of the Dissections of Morbid Bodies*, p. 256.

Parts of both the preceding cases are published by Mr. Thurnam in a paper, "On Aneurisms of the Heart," in the Medico-Chirurgical Transactions, vol. xxi. pp. 213–215; and a part of No. 333 is represented in the same volume, pl. iii. fig. 2.

[In addition to the two preceding cases the following are inserted, both because they perhaps belong to the preparations No. 552, 553, and because they explain Mr. Hunter's opinions, hitherto unpublished, on the nature and distinction of clots (or polypi, as they have been called) formed in the heart before and after death.]

"*Palpitation of the Heart.*

"Captain Harris has been troubled with a palpitation of the heart for some time, which came upon him, when shut up in a dungeon in a French prison. It often leaves him, and then he is very well; but when he is attacked (which is very often), the heart beats with extreme frequency, viz. 160 in a minute. The shock against the ribs is so strong as to be seen through his common clothes, and can easily be heard in a still room. This violent motion of the heart shakes the whole body, which is easily to be seen. While in one of these fits, which often lasts for weeks, he will be extremely cold, then hot, and then break out in a sweat. Sometimes the palpitation will leave him all at once, and then he is well, but will immediately return again. While in the fit a little thing fatigues him, and he breathes with great difficulty. Something seems to rise in his throat, and then his head is affected, and he feels as if going to expire. Surprise will sometimes bring it on, and another will often carry it off. Bleeding in the time of the fit is the only relief."—*Hunterian MS. Cases in Medicine and Surgery*, p. 455.

"May 1757.—With Doctor Pringle, I opened the body of Mr. Harris, a man about forty or upwards. His abdominal viscera were very sound, excepting the kidney on the left side, [which] was become white in some places. The right lobe of the lungs adhered everywhere to the ribs and sternum, excepting a little part on the posterior surface; which space was filled with water, and was very likely the cause of the non-adherence of that part. The left lobe only adhered at the upper part; and there was near half-a-pint of water in that side.

"On opening the pericardium we found a little more water than usual in health. The heart was very large, and not very fat. On cutting into the right auricle, I found its coats very thick and muscular: and a large polypus, nearly filling the whole auricle, extended into the ventricle; from thence into the pulmonary artery, and was continued into the two venæ cavæ. This polypus was white on the upper surface, and black on the under. In the veins it was not so firm, and blacker; the same in the pulmonary artery; became more and more so towards the extremities of the smaller ramifications: and where the pulmonary valves were, there were plainly the marks of them on the polypus.

On opening the left auricle, I found it stronger than usual, and a good deal of coagulated blood in it, not of the buff-colour, nor of that strength. The left ventricle towards the apex had a great many of the fasciculi become hard, callous, and white; while the other parts were of their natural consistence and colour. At those white parts were entangled a great many pieces of coagulated blood, one of which was as large as a walnut. This whiteness is common to all muscles that have lost their action, let the cause be what it will; and this may be the case in other parts of the body, viz., the kidney. Those coagula were very different from those formed after death: the first had all the appearance of recent coagulated blood, after it has been taken from the body; this had all the appearance that blood has in an aneurism, for it is irregular, and the colour is not higher on one side more than on the other, and is generally redder than the other polypus, which redness is of a darkish brown.

"Now, as we see a great difference between these two polypi, one, we are certain, arises from want of action, and is like all other that are formed gradually, and from the want of action; while the other is like the settling of common blood after death; in every respect, is much more in quantity than we can expect, and takes on the forms of parts, as all blood quite at rest would. From these circumstances, I should think one was formed before death, the other after, or, at soonest, at the time of death; and as we see that blood, being left to rest, and only allowed to cool gradually, takes on more and more of the buff colour and consistence in proportion to these two circumstances; and this must be the case with the blood in a dead person: but why the blood should take on this appearance in the right ventricle more than the left, I do not pretend to say."—*Hunterian Manuscript; Account of the Dissections of Morbid Bodies*, p. 33.

"I opened a man at St. George's Hospital. He was supposed to be consumptive, but was a little dropsical. His lungs were more solid than what is usual for that viscus in a sound state, but no partial disease nor hardness, nor adhesions of any consequence. There was a good deal of liquor pericardii mixed with coagulable lymph. His heart was very large and white in its coats, somewhat like the flesh of veal. In the apex of the left ventricle there was a substance about the bigness of a pigeon's egg, but more flat. Its detached surface was smooth, but a little uneven, like the external surface of the brain, was of a whitish cast, streaked with brown or red, and pulpy to the feel. When cut into, it proved to be softer in its middle than external surface, so that the external surface had formed a kind of coat. Its substance seemed to be half dissolved into a whitish brown fluid, of the consistence of cream. Cutting this was something like cutting into the udder of a cow that was giving milk, [in which] the milk is seen mixed a little with blood on the cut surface. I found that this substance was entirely separable from the substance of the heart, and only connected to it by being entangled in the fasciculi of that part. The parts of it that passed in between the fasciculi were firmer

than what the body of the tumour was, and had the appearance of aneurismal blood. This substance, I do suppose was originally blood, but whether formed from that blood which was within the cavity of the ventricle to be thrown out by the aorta, or whether an exudation of coagulable lymph from the substance of the heart at this part, is not easy to determine. If the first, this part of the heart must have been paralytic; but which ever way it was, it was not now sound blood; and its disease was that of blood. If I remember right this substance had the same appearance with that substance found in the back of a young man described in a paper given in by Dr. Knox in the London Essays. I asked some of the pupils who had attended him before death, if he had had an irregular pulse for some time, and was answered in the affirmative.

"This was one of the peripneumonics. Was not the dropsy owing to the disease in the lungs, and more especially to this kind?" *Hunterian Manuscript; Account of the Dissections of Morbid Bodies*, p. 221.

562. Parts of a right femoral artery and vein from a patient in whom the right leg mortified. The artery is completely filled with firm, round, dry, rust-coloured and adherent coagulum or thrombus. The lower part of the vein is similarly filled; and in its upper part is a small flattened coagulum, apparently more recently formed, and not adherent to the walls. *Hunterian.*

563. The bifurcation of the aorta and part of the vena cava inferior from the same patient as the specimen last described. The right common and external iliac arteries are filled with the same kind of firm round coagulum. The aorta and left iliac artery are healthy but of small size. The vein also appears healthy. *Hunterian.*

"Motion seems to retard coagulation*; yet we know for certain that blood will in time coagulate even in the vessels themselves, and under certain circumstances sooner, perhaps, than anywhere else, as, for instance, when there is a disposition to mortification. In this case we find the blood coagulated even in the larger vessels.

"I have seen a mortification come on the foot and leg, and when it had advanced only to a certain degree the patient died. On

* This is motion given to it in a vessel, without any empty space, and having beads put into it, which are shaken.

examining the parts above the mortified part, I found the crural and iliac arteries filled completely with strong coagulated blood: we may thence infer that the tendency to mortification in the vessels produced this disposition in the blood. If the coagulation should be supposed to have arisen from the blood being stopped in the large vessels at the mortified part, let us reflect that this cannot account for it: the same thing ought then to happen in an amputation, or in any case where the larger vessels are tied up."—*Hunter, On the Blood, &c.: Works*, vol. iii. p. 30.

564. Portion of an artery with a round firm clot of blood adhering to its walls. The internal coat of the artery is deeply wrinkled transversely, and a thin layer of clot is attached to it. *Hunterian.*

565. Section of a large mass of laminated coagulum partially decolorized, from an aneurism of the aorta. *Hunterian.*

566. A large quantity of laminated coagulum from an aneurism in a Lion. Its layers have been artificially separated. *Hunterian.*

567. Partially separated layers of coagulated and decolorized blood from the sac of an aneurism. *From the Museum of Sir A. P. Cooper.*

568. "A coagulum from an aneurism." [*Hunterian MS. Catalogue.*] It has not the usual laminated structure of the coagula formed in aneurismal sacs during life. *Hunterian.*

568 A. The end of a femoral artery, after amputation, containing a small, flat, pale coagulum, which Mr. Hunter believed that he had injected.

"As extravasation arises from a rupture of a vessel, it is of service in the reunion of that vessel: if there are more solids ruptured than a vessel, as in a fracture of a bone, it becomes a bond of union to those parts; and this may be called union by the first intention; but the union is not that of the two parts to each other, but the union of the broken parts to the intermediate extravasated blood; so that it is the blood and parts uniting which constitutes the union by the first intention.

"This blood, so extravasated, either forms vessels in itself, or vessels shoot out from the original surface of contact into it, forming an elongation of themselves, as we have reason to suppose they do in granulations. I have reason, however, to believe that the coagulum has the power, under necessary circumstances, to form vessels in and of itself; for I have already observed that coagulation, although not organic, is still of a peculiar form, structure, or arrangement, so as to take on necessary action, which, I should suppose, is somewhat similar to muscular action. I think I have been able to inject what I suspected to be the beginning of a vascular formation in a coagulum, when it could not derive any vessels from the surrounding parts. By injecting the crural artery of a stump above the knee, where there was a small pyramidal coagulum, I have filled this coagulum with my injection as if it had been cellular; but there was no regular structure of vessels. When I compare this appearance with that of many violent inflammations on surfaces where the red blood is extravasated, forming, as it were, specks of extravasation like stars, and which, when injected, produce the same appearance with what I have described in the injection of the coagulum; when I compare this again with the progress of vascularity in the membranes of the chick, where one can perceive a zone of specks beyond the surface of regular vessels close to the chick, similar to the above extravasation, and which in a few hours become vascular, I conceive that these parts have a power of forming vessels within themselves, all of them acting upon the same principle. But where this coagulum can form an immediate union with the surrounding parts, it either receives vessels at this surface, or forms vessels first at this union, which communicate with those of the surrounding surface; and they either shoot deeper and deeper, or form vessels deeper and deeper, in the coagulum, till they all meet in its centre. If it is by the first mode, viz., the shooting of vessels from the surrounding surfaces into the coagulum, then it may be the ruptured vessels, in cases of accident, which shoot into the coagulum; and where a coagulum, or extravasation of coagulable lymph, is thrown in between two [sound] surfaces only contiguous, there it may be the exhaling vessels of those surfaces which now become the vessels of the part. In whatever way they meet in the centre, they instantly embrace, unite, or inosculate. Now this is all perfectly and easily conceived among living parts, but not otherwise."—*Hunter, On the Blood, &c.: Works*, vol. iii. p. 118.

A notice of this preparation will be found in a concise view of Mr. Hunter's then new opinions concerning the life of the blood, in Dr. Duncan's 'Medical Commentaries,' vol. ii. p. 198 (London, 1774), under the head of "Medical News."

569. Part of the jugular vein of an Ass, the cavity of which is in many places obliterated, and in the intervening spaces is filled with masses of pale coagula of blood, or lymph. All

the tissues, for some distance around the vein, are thickened and consolidated; so that the outline of the section of its coats cannot be distinguished. Its cavity is also contracted to less than half the size of that of the healthy jugular vein of an Ass. *Hunterian.*

570. Portions of two uterine veins having small spherical phleboliths within them.

From the Museum of George Langstaff, Esq.

571. A section of a heart, the apex having been removed and the left ventricle laid open, showing general hypertrophy. The aortic and mitral valves are thickened from old disease, and large fungous vegetations, formed chiefly from adherent blood-clot, are upon the valves and chordæ tendineæ of the left side. Some of the chordæ tendineæ are completely detached from the mitral valve by ulceration.

From a woman, aged 24, who had suffered from several attacks of rheumatism. She died with extensive pulmonary apoplexy, and embolism in the vessels of other viscera.

Part of one lung is No. 575; the spleen 576.

Presented by Dr. Goodhart, 1875.

572. Part of an aorta, with the adjacent auriculo-ventricular aperture and mitral valve. The aortic valves, particularly the two anterior cusps, are much thickened; and the right anterior valve is retroverted and has vegetations on its surface. The posterior cusp has undergone inflammation and softening, and has yielded so as to form a pouch which is perforated in two places. A similar small pouch or aneurism, projecting towards the auricle, may be seen on the mitral valve near the edge; this valve is very thick, and its ventricular aspect is covered with large vegetations like those in the preceding specimen.

From a man, æt. 50. He had suffered from chronic bronchitis and dyspnœa for years before his death; and ten years before he had had a severe attack of rheumatic fever. He had urgent dyspnœa before death. The stethoscopic signs were not noted. He had general dropsy, considerable effusion into the right

pleural cavity; and the left pleura pulmonalis was adherent. The kidneys were congested, large, and mottled. The heart weighed 23 oz. (Trans. Path. Soc. vol. iii. p. 77, 1860-62.)

Presented by Dr. Peacock, 1876.

Embolism and Infarctus.

573. The intracranial portion of a right internal carotid artery, with its main branches. The trunk is completely blocked by a long and firm pale yellowish clot. The arterial coats at the part which is thus obliterated are thickened, and have some morbid deposits between them; elsewhere, and in the branches, their texture appears healthy.

From a man, 50 years old, who died with effusion of blood in one of the middle lobes of the cerebrum. A large quantity of fluid, also, was found in the membranes and the cavities of the ventricles; and there was tuberculous disease of the lungs.

From the Museum of George Langstaff, Esq.

574. An aneurism, the result of embolism, in the right posterior cerebral artery. It was situated on that vessel as it wound round the crus cerebri about the middle of the gyrus hippocampi.

From a youth aged 19. About a year before his death he had his first attack of acute rheumatism. This was accompanied by the development of a double aortic bruit; and he had never been well since. His second attack of rheumatism commenced shortly before his death. He was treated at home; and when sitting up for the first time as a convalescent, he fell down insensible with right hemiplegia. Five days later he came to the Hospital. He was then hemiplegic; sensation being unimpaired. His speech was thick; but he could say what he wished. His heart was large; there was an aortic regurgitant murmur; and his urine contained a sixth of albumen. He died delirious.

A large hæmorrhage was found in the substance of the left hemisphere, with softening round it. No aneurism could be found at this spot, even after a prolonged search and with the aid of maceration. The vessels at the base were all quite healthy except the one upon which the aneurism is seated. The heart weighed 20 oz. The aortic valves were adherent, thickened, and distorted with long fibrinous vegetations dependent from them. The spleen weighed 32 oz., and was very soft. The kidneys,

weighing 15 oz., were in a somewhat advanced state of parenchymatous nephritis.

The case is recorded in the 'Transactions of the Pathological Society,' vol. xxviii. p. 110, Case 3.

Presented by Dr. Goodhart, 1877.

575. A section of a lung, showing a large extravasation of blood, or "pulmonary infarct," in the lower lobe, the greater part of which has solidified, and has its vessels filled with coagula.

From a woman aged 24, who had suffered from several attacks of rheumatic fever, the last commencing about four months before her death. There was a loud systolic bruit at the apex of the heart. She was seized suddenly with left hemiplegia and paralysis of the right third nerve, and she died comatose. The *post-mortem* examination showed embolism of the basilar artery, softening of the brain, and embolic infarcts in other viscera, due to transference of materials from vegetations on the aortic and mitral valves.

Part of the heart is in No. 571, and the spleen in 576.

Presented by Dr. Goodhart, 1875.

576. The spleen of the same patient, displaying upon its surface some large yellow patches, the result of embolic infarction. The surface is deeply fissured through contraction of the infarcts and wasting of the substance of the spleen, and is covered with numerous flocculent adhesions.

Presented by Dr. Goodhart, 1875.

577. A small portion of the outer part of the upper lobe of a right lung. A vertical incision has been made from the surface of the lung inwards; and the portions thus divided have been kept apart to display the interior. Immediately under the surface is a spherical mass of pale, soft material, about two lines in diameter. Its limits are indicated on one side by bristles. When fresh it was purulent in the centre, and appeared on the surface of the lung as a white point surrounded by several dark concentric rings of hyperæmic tissue.

From a woman aged 49. Twelve days after the removal of a large ovarian cyst, she had an attack of facial erysipelas followed by otorrhœa, parotitis, and necrosis of the lower jaw: and she died

three weeks after the operation. Several other embolic infarcts like this were found in the lungs. The pericardium contained two ounces of pus. There were small abscesses in the kidneys, and pus in the remaining ovary, which was becoming cystic. The stump of the pedicle of the ovary which had been removed was sloughy; there was no free fluid in the peritoneal cavity. The operation-wound in the abdominal walls, which had united perfectly, is preserved, No. 55.

The case is described by Dr. Bantock in the 'Medical Times and Gazette,' vol. ii. 1879, p. 607, and in MS. Notes, vol. iii. p. 142.

Presented by Alban Doran, Esq., 1879.

The specimens by which Mr. Hunter illustrated his views concerning the organization and the reparative power of the blood are Nos. 558, 558 C, 558 D, 559, and 568 A; other similar specimens may be found by reference to the Series of Diseases of the Arteries, Nos. 3074 to 3083, and Diseases of the Testicle, Nos. 4151 to 4160.

The following are the principal other specimens of Morbid Conditions of the Blood, viz.:—

Clots formed of effused Blood, in the Series of Diseases of the Brain, Nos. 3753 to 3762, and of the Testicle, Nos. 4151 to 4160.

Clots formed in the Heart: Nos. 2938, 2939, 2949, 2951, 2953, 2955, 2992, and 2995.

Clots formed in the Arteries, see the specimens of Aneurism, Nos. 3139 to 3261; and the specimens showing the effects of the ligature of the Arteries, Nos. 3074 to 3083.

Embolism: Nos. 3297, 3298.

Thrombosis: Nos. 3263, 3264, 3265, 3278, 3286, 3289 to 3296, 3299 to 3304.

Phleboliths: Nos. 2802, 2803, 3257, 3307 to 3310.

Infarctus: No. 576.

Series VIII. INJURIES AND DISEASES OF VOLUNTARY MUSCLES.

Pseudo-hypertrophy: 577 A.
Atrophy and Fatty Degeneration: 578.
Rupture: 579 to 582.
Gumma: 583.
Calcification: 584.
Tumours: 585, 586.
Entozoa: 587, 588.

577 A. The gastrocnemius muscle with the tendo Achillis and a portion of the os calcis of a boy who was affected with pseudo-hypertrophic paralysis. The tendo Achillis was divided subcutaneously four years before his death. The cut ends of the tendon are perfectly united by a band of newly-formed fibrous tissue an inch and a half long, which could readily be distinguished in the recent state from the tendon itself. The gastrocnemius muscle is not more than one third of the normal size, and presents the appearance of a mass of adipose tissue. No trace of red tint as of muscle could be found; but bundles of muscle-fibres, as shown by microscopic examination, lay in the fatty tissue. The transverse striation of the fibres was, for the most part, distinct; but here and there the striæ were replaced by granules distributed uniformly through the fibre. A considerable amount of connective tissue accompanied the muscular bundles, and its fibres lay parallel to them.

The spinal cord showed softening and disintegration chiefly situated in the grey matter.

In infancy the boy was well-nourished and apparently healthy. He did not, however, begin to walk until $2\frac{1}{2}$ or 3 years old. The calves were at that time observed to be unusually large. When five or six years old he became liable to fall in walking, and had great difficulty in getting-up again. His heels then gradually became drawn up; and as this condition increased his

power of walking failed. At the age of $10\frac{1}{2}$ years the Achilles-tendons were divided. He could then sit upright in a chair, but had great difficulty in raising himself from the horizontal to the sitting posture, chiefly on account of weakness about the muscles of the shoulder. The hypertrophic condition of certain muscles at first observed subsequently gave place to atrophy of all the muscles of the trunk and extremities, with loss of power of motion in the shoulder-, elbow-, hip-, and knee-joints. He died of pulmonary disease at the age of $14\frac{1}{2}$ years.

For a further account of the case see 'Medico-Chirurgical Transactions,' vol. lvii. p. 247, and 'Transactions of the Pathological Society,' vol. xxxi. p. 372.

Presented by William Adams, Esq., 1882.

578. Part of a gastrocnemius muscle, from a case of club-foot. It illustrates the fatty degeneration of muscle from paralysis and long disuse. The muscular tissue cannot be discerned; its place is occupied by fat, the particles of which present traces of a linear arrangement.

From the Museum of Sir A. P. Cooper.

579. The lower part of a left rectus abdominis muscle, a portion of which was ruptured during contraction in tetanus. The portion above the laceration is retracted and swollen.

From a man aged 22, admitted into the London Hospital with compound dislocation of the right great toe. On the tenth day symptoms of tetanus appeared; the disease soon assumed a severe type; and after twelve days the patient died. Trismus and rigidity of the recti abdominis muscles were very marked, the former throughout the attack of tetanus, the latter for six or seven days preceding death. (See 'A Treatise on Tetanus,' 1834, by Thomas Blizard Curling, Esq., pp. 75 and 158.)

Presented by Thomas Blizard Curling, Esq.

580. The lower part of a right rectus abdominis muscle ruptured by tetanic contraction. As in the preceding specimen, the portion above the rupture is much retracted.

From a muscular man aged 46, who received a wound in the great toe three weeks previous to his admission into the London Hospital on May 18th, 1863. He complained of pain in the hypogastrium on the 20th, around a depression above which ful-

ness could be detected, and he died on the 28th. Nearly the whole thickness of the right rectus abdominis muscle was found torn transversely about an inch above the crest of the pubes; the upper part had retracted about two inches, and was surrounded by broken-up blood-clots. (See Trans. Path. Soc. vol. xv. p. 235.)

Presented by Thomas Blizard Curling, Esq., 1863.

581. A portion of an adductor magnus muscle in the neighbourhood of "Hunter's canal," a small segment of the femoral artery being left *in situ*. The muscle was ruptured during life, the superficial fibres vertically to the extent of about two inches, the deeper transversely. The lower angle of the rent is occupied by loose coagulum; behind its upper part the deeper injured fibres appear as a firm conical body with the apex downwards. This had the appearance of a large clot, but, on careful examination, proved to be entirely made-up of muscular fibres.

From a Dissection-subject, 1868.

582. A thumb blown from the hand by the explosion of gunpowder. The long flexor tendon and one of the extensor tendons have been pulled-out from their muscles, retaining their attachments to the bones, and having portions of muscular fibres connected with them.

From the Museum of Robert Liston, Esq.

583. "The texture of muscles destroyed by the extravasation of coagulable lymph" [*Hunterian MS. Catalogue*]. The muscle, apparently a part of the soleus, has nearly lost its fibrous aspect; its surface has a greyish hue, and its tissues appear consolidated. At and near its attachment to the tendon there is a whitish, firm, perhaps gummatous deposit in it. *Hunterian.*

584. A small portion of bone from the diaphragm of a horse. *Hunterian.*

585. Portion of a pectoral muscle in which are several distinct, small, oval, hard and white cancerous tumours. The fasciculi of the muscle among which they are imbedded appear healthy. *Hunterian.*

586. A large encapsuled tumour about five inches in diameter, from the sheath of the right rectus abdominis, which is laid open. Externally the tumour presents but faint traces of lobulation; its cut surface is uniform and of a dull white colour. On microscopical examination it appeared to be made up partly of fibres, partly of small spindle-cells.

From a woman aged 22, in whom it had existed for two years. It was removed, and the patient made a good recovery.

Presented by Walter Rivington, Esq., 1877.

587. A small portion of a gluteus maximus muscle, with a large acephalocyst hydatid which was removed from it; the external thin cyst, within which the hydatid was enclosed, is attached to the portion of muscle.

The patient was a healthy woman, 40 years old. The tumour was of the size of a large melon; it had been growing for nearly five years, and had occasioned pain in the thigh and leg and inconvenience in walking for six months before its removal. The integuments covering it adhered firmly; and the cyst was so closely united to the fibres of the gluteus, in which it was deeply imbedded, as well as to some large branches of the gluteal artery, that after much of it had been removed with difficulty, it was thought advisable not to attempt the separation of the rest. The patient quickly and completely recovered after the operation. The hydatid contained about a pint and a half of fluid.

From the Museum of George Langstaff, Esq.

588. A portion of the biceps muscle with *Trichina spiralis*. The cysts enclosing the parasites are seen as scattered minute white specks, with their long axes in the direction of the muscular fibres.

From a German, aged 65, who died at the London Hospital from the effects of an accident. All the voluntary muscles that could be examined were found to be affected: but the heart, unstriped muscular tissues, and other structures were free. As all the parasites were found to be encysted, the disease was probably of old date. The patient had not been out of England for thirty-six years, but he was in the habit of eating German sausages. He was well nourished, and no symptoms referable to trichinosis could be traced.

Presented by T. Blizard Curling, Esq., 1866.

For referenees to other speeimens of Injuries and Diseases of Muscles, see p. 25.

Series IX.

INJURIES AND DISEASES OF TENDONS AND SHEATHS OF TENDONS.

Division and Repair: 589 to 599.
Open: 589 to 593.
Subcutaneous: 594 to 599.
Rupture or destruction by disease: 600, 601, 602.
Gouty disease: 603, 604, 605.
Tumours in, or in relation with: 606, 607, 608.
Melon-seed bodies (*Corpora oryzoidea*): 609, 610, 611.

589. A tendo Achillis which, together with the integuments behind it, appears to have been cut through. It has united by a tough, irregularly fibrous tissue, the surface of which is closely connected with the depressed and partially ulcerated cicatrix of the integuments. *Hunterian.*

590. Part of the tendo Achillis of an ass, which was divided transversely, but probably not by subcutaneous incision. The upper part alone of the tendon is shown: below it a tough and compact vascular substance, like that last described, extends nearly four inches downwards. One of the surfaces of this substance is covered with a thin layer of lymph, as if it had formed part of an open granulating wound. *Hunterian.*

591. Part of a tendo Achillis which was divided, and was in progress towards re-union. The uniting substance is firm, compact, pale and obscurely fibrous, and its posterior surface is covered with healthy and very vascular granulations.

From the Museum of Sir A. P. Cooper.

592. A thin dried section of the granulations from the preceding specimen, showing their vascularity, and that their vessels, after running in nearly parallel wavy lines perpendicular

to the surface of the uniting substance, are very closely arranged on the free surface of the granulations.

From the Museum of Sir A. P. Cooper.

593. A similar preparation.

From the Museum of Sir A. P. Cooper.

Nos. 60 and 61 are other sections of the same parts.

594. A longitudinal section of the tendo Achillis and of part of the os calcis of an ass. The tendon was divided transversely and, it is believed, by subcutaneous section. Its divided extremities have retracted to a considerable distance from each other, but are united by a firm and compact substance, pale though vascular, and presenting no appearance of a fibrous texture. A similar substance is diffused among the immediately adjacent tissues. *Hunterian.*

In the Life of John Hunter by Sir Everard Home, appended to Hunter's 'Treatise on the Blood, Inflammation and Gun-shot Wounds,' it is stated that he ruptured his own Tendo Achillis, which turned his attention to the mode of union of broken tendons. "He divided the Tendo Achillis of several dogs by introducing a couching-needle through the skin at some distance from it, and with the edge cut through the tendon; in this way the orifice in the skin healed up, and made it similar to a broken tendon. The dogs were killed at different periods, to show the progress of union, which was exactly similar to that of a fractured bone when there is no wound in the skin." These experiments were performed in 1767, five years before Home began to work under Hunter; but there is little doubt that this specimen is also the result of a subcutaneous section.

595. The tendo Achillis of a deer which was divided transversely and, it is believed, by subcutaneous section. Its interior is shown by a longitudinal incision. The divided extremities are not so far apart as those in the preceding specimen; and the substance uniting them, which is of rather lesser diameter than the tendon, is harder, paler, and obscurely fibrous, like the tissue of a firm and well-formed cicatrix.

Hunterian.

596. The other section of the same tendon.

597, 598, 599. The tendo Achillis and the tendons of the anterior and posterior tibial muscles of a child nineteen months old. They were all divided by subcutaneous section nearly eighteen months before death. No trace of the division is discernible in any of them ; their outlines and surfaces are regular, and their texture is uniform ; even with the microscope no part could be found different from the rest.

The child was born with talipes varus. The tendons were divided when it was five weeks old. Six weeks afterwards the foot appeared well formed ; and it was finally used as freely as the other.

Presented by Richard W. Tamplin, Esq.

600. The bones and ligaments of a right shoulder-joint. The intracapsular portion of the long tendon of the biceps muscle was ruptured or otherwise destroyed; and the lower portion is adherent to the capsule of the joint and the bicipital groove. The head of the humerus was lying in contact with the under surface of the acromion process of the scapula, which appears to have been fractured about an inch from its extremity and to have been reunited by ligament. The articular cartilages of the humerus and scapula are slightly roughened on the surface, and the synovial membrane is thickened. The bone appears enlarged and nodular in the neighbourhood of the lesser tuberosity.

This and the two following preparations were presented as illustrations of the effects of accidental rupture of the long tendon of the biceps. The history of the patient during life was unknown ; and it is not improbable that the changes in the tendon may be due to chronic disease in the joint.

This, with the two following specimens, accompanied the Jacksonian Prize Essay for 1846, *by Thomas Callaway, Esq*

601. The bones and ligaments of a right shoulder-joint, exhibiting similar changes. The extremity of the upper portion of the biceps tendon is fringed and flocculent. The lower portion of the tendon has been cut-away. The capsule is much thickened.

602. "Head of the humerus, altered by pressure against the under surface of the acromion ; the shell of the bone on one side has passed upwards into the cancellated structure. It was taken from a case of ruptured tendon of the biceps."

It appears more probable that the changes followed a fracture through the anatomical neck of the humerus many years before death.

603. "Gouty matter upon the tendon of a finger."

Hunterian MS. Catalogue.

604. A similar preparation. *Hunterian.*

605. A finger with gouty disease of the extensor tendon near its attachment to the last phalanx, and a cavity which contained gouty matter over the articulation between the first and second phalanges. *Hunterian.*

606. A longitudinal section of a portion of the tendo Achillis, with a firm, flattened, nodular tumour developed upon and closely adhering to its surface. The tumour consists of cartilaginous tissue, the deeper portions of which have undergone ossification. None of the fibres of the tendon can be traced over the surface of the tumour.

From the leg of an otherwise healthy person. The disease commenced twelve months before its removal, the principal growth having taken place during the last three months.

607. The other section of the same tumour.

Presented by Richard W. Tamplin, Esq.

608. An oval, lobulated tumour, three quarters of an inch in its long diameter, removed from near the internal malleolus. It had no connexion with any tendons, and had been increasing for twenty years very slowly. On microscopic examination it was found to be made-up almost entirely of small round cells enclosed in the meshes of an abundant reticular connective

tissue. It is suspected to have been formed in and to have outgrown from the sheath of a tendon. See MS. Notes, vol. i. p. 375. *Presented by Edward Cock, Esq.*, 1872.

609. A large collection of "melon-seed" bodies from the sheath of a tendon. *Hunterian.*

610. A collection of loose "melon-seed" bodies taken from two ganglia connected with the sheaths of the tendons on the back of the hand and the palmar surface of the fingers.
Presented by John Hilton, Esq., 1867.

611. A collection of "melon-seed" bodies which were removed from the sheath of the tendon of the flexor sublimis digitorum. On pricking them, when recent, they collapsed, exuding a viscid fluid, probably of the nature of mucin. Each body appeared to be made entirely of very delicate fibrils, with granular and fatty matter, resembling "coagulated lymph" in serous cavities.
Presented by Dr. Charles R. Bree, 1875.

Among other specimens of Injuries and Diseases of the Muscles are the following:—

Rupture of unstriped muscle: 2942 to 2945, 2956, 2957, 3650, 3652, 4728 to 4731.

Hypertrophy: 2923, 3009, 3660, 3661, 3718, 3729, 4385, 4416, and other specimens among the Diseases of the Heart, Urinary Bladder, and Urethra.

Atrophy: 40, 41, 2910, 2936, 2941, 2942, 2944.

Ossification: 1616 A.

Cancerous infiltration: 4806.

Of Injuries and Diseases of Tendons: 58, 59.

Healings after wounds or ruptures: 558 B, 558 C, 577 A.

Adhesion: 174.

Series X. DISEASES OF BURSÆ AND SYNOVIAL GANGLIA.

Patellar: 613, 615 to 621.
From other parts: 612, 614, 622, 623.
Synovial Ganglion: 623.
Loose Bodies—Melon-seed bodies (*Corpora oryzoidea*): 624 to 631.

612. A vertical section of a knee-joint. The whole of the articular cartilage has been removed from the femur, and a great part of it from the tibia and patella. The exposed bones are superficially ulcerated and are covered with thin flakes of lymph. The subcrural bursa (in consequence, probably, of acute inflammation) is large, as if it had been distended with fluid, and appears to be lined by a thin uniform layer of finely granular lymph. The tissues round it are condensed. *Presented by Sir William Blizard.*

613. The front of a knee with an enlarged bursa over the patella. The interior of the bursa forms a single cavity, which appears fasciculated with interlacing bands of shining fibres. Its walls are consolidated with the surrounding textures.

Hunterian.

614. A portion of the skin, with an enlarged bursa beneath it, from the inner surface of a distorted and prominent metatarso-phalangeal joint. The cyst is about half an inch in diameter, has delicate translucent walls, and contained a colourless glairy fluid. On one side are two smaller cysts communicating by apertures with the cavity of the larger one. *From an old man, a Dissection-subject*, 1864.

615. A bursa removed from the front of a woman's patella. Its walls are very thick, tough, and fibrous; its cavity contained small, thin, oval, seed-like bodies, like those in Nos. 624 to 631. *Presented by Edward Stanley, Esq.*

616. An enlarged bursa from the front of a patella. The walls of the bursa are nearly a line in thickness and appear very tough and laminated ; its exterior is smooth ; its internal surface is rough and and has two irregular masses of a substance like soft fibrin attached to it and hanging loosely into its cavity. *Presented by John Gunning, Esq.*

617. An enlarged bursa patellæ from a woman aged 40. Its walls are from one eighth to one quarter of an inch in thickness, and its cavity is much dilated.

It had been increasing gradually and slowly in size since its first appearance two years before removal. (See MS. Notes, vol. i. p. 146.)

Presented by Edward Cock, Esq., 1868.

618. An enlarged bursa patellæ. The central cavity is about two inches in diameter, and the walls are thick and fibrous.

From a woman, 36 years old, from whom it was removed in the London Hospital.

Presented by T. Blizard Curling, Esq.

619. A very large bursa patellæ, measuring about four inches in its vertical diameter. Its interior is a single cavity, with a lining of a partly tuberous, partly flocculent material, consisting of outgrowths from the inner surface of the bursa, lined with blood-clot. When fresh it was as large as an infant's head, and contained upwards of half a pint of gummy fluid.

Excised from the knee of a woman aged 48. It had existed for fourteen years, and had been punctured shortly before removal. (See Trans. Path. Soc. vol. xxxi. p. 383.)

Presented by Jonathan Hutchinson, Esq., 1879.

620. An oval mass of fibrous tissue, removed from the front of the patella of a middle-aged woman. It may have been formed through changes in the walls of an enlarged bursa, of which thickening, increasing beyond the degrees shown

in the preceding specimens, led to the obliteration of the cavity. The obliteration is complete, unless the cavity is represented by the minute depression on one surface of the section. *Presented by Thomas Wormald, Esq.*, 1865.

621. An enlarged and consolidated bursa patellæ from the left knee, laid open by vertical incision. It closely resembles the last specimen ; but its cavity may be clearly recognized, on each side of the cut surface, as a semilunar cleft with the concavity backwards.

From a woman aged 35. The right lower extremity was distorted by talipes equinus, the result of infantile paralysis. (MS. Notes, vol. ii. p. 198.)

Presented by W. Spencer Watson, Esq., 1875.

622. The upper end of the left radius of a woman aged 36. The bursa beneath the tendon of the biceps is enlarged ; and the tubercle of the radius is expanded, flattened, and nodulated at the edges. *From a Dissection-subject*, 1862.

623. The tendon of a flexor carpi radialis muscle, to the outer surface of which a small "ganglionic" tumour, or bursa, is attached. This was situated in the substance of the loose fibro-cellular investment of the tendon, and was slightly connected with the tendon itself.

From the Museum of John Howship, Esq.

624. Several small, flat, hard bodies from a ganglion, or enlarged subcutaneous bursa, which was situated on a wrist.

Hunterian.

625. A numerous collection of small white, round and oval bodies, many of which are in the form of cells with thick walls. They were removed from a ganglion on a wrist.

626. A collection of similar bodies, from a ganglion.

627. A similar specimen, with rather larger bodies.

628. Some similar bodies, with small narrow processes extending from one of their extremities, like pedicles, by which they may have been at some time attached to the inner surface of a ganglion.

629. A few small flattened and apparently solid bodies, some oval, some irregular in shape, from a ganglion on the wrist.

630. A collection of large irregularly shaped solid bodies*, from a ganglion on the wrist. They are soft; and many of them are lobulated and connected by narrow processes, as if formed on or in synovial fringes.

The six preceding specimens are from the Museum of Sir A. P. Cooper.

631. A small, flat, oval portion of fibro-cartilage, removed from an enlarged bursa. *Hunterian.*

Among other specimens of Diseases of Bursæ in the Museum are the following:—

Inflammation: 1786, 1787.

Formation of adventitious bursæ; 9, 4025.

* Concerning Mr. Hunter's opinion on the formation of these loose bodies, see former edition, vol. i. p. 142.

Series XI. INJURIES AND DISEASES OF CARTILAGE.

Ossification : 632, 633, 647.
Fracture and Repair : 634 to 636.
Fibrous Degeneration and Removal : 637, 638, 639.
Ulceration : 640 to 645.
Necrosis : 646 to 648.

632. A larynx and trachea, with part of the bronchi, in all of which the cartilages are completely ossified. In the epiglottis, and in the membranes extending from it to the arytenoid cartilages, there are numerous small formations of bone. In the crico-thyroid membrane also, and in the membrane uniting some of the rings of the trachea, there are a few similar formations.

Presented by Sir William Blizard.

633. A larynx with its cartilages very extensively ossified.

From an old soldier.

Presented by Dr. G. Duncan Gibb, 1868.

634. A portion of a fractured costal cartilage. The broken extremities are widely separated, and the space between them is filled by a layer of porous osseous tissue more than a quarter of an inch thick. The perichondrium is continued over the bone, from one portion of the cartilage to the other.

Hunterian.

635. Dried sections of two costal cartilages, including the adjacent part of the sternum with which they articulate. They have been fractured; and their overlapping fragments are united by a soft tissue having the appearance of cartilage.

Presented by Thomas Blizard Curling, Esq.

636. A patella, which has been fractured transversely. The two fragments have become united by ligamentous tissue. The

articular cartilage, which is not so smooth and shining on its free surface as in the normal state, is also repaired by ligamentous tissue which, even towards the middle line where the severed halves of the cartilage lie nearest to one another, has not become cartilaginous.

Presented by Richard Partridge, Esq., 1868.

637. A patella, of which a part of the articular cartilage presents fibrous degeneration, probably due to chronic rheumatic arthritis or rheumatic gout. Of the diseased part, some small portions have been removed; the rest is changed into short, thick, and soft fibres, which are closely set perpendicularly to the surface of the bone. The length of most of these fibres is about equal to the natural thickness of the cartilage; but around the margin of the diseased part many are twice as long, and hang like loosely attached coarse threads. In the neighbourhood of the same part, the cartilage is cracked in several directions, and appears as if it had been in progress towards the change just described. The synovial membrane and other parts connected with the patella are healthy. *Presented by Sir William Blizard.*

638. The head of a femur showing changes in its articular cartilage, in the neighbourhood of the round ligament which remains entire. The diseased cartilage forms a horseshoe-shaped patch, shreddy and flocculent, and at no point so far destroyed as to expose the bone; at one part it is more bulky than the normal cartilage, rising considerably above its level; elsewhere the sharp eroded border of healthy cartilage overhangs the diseased tissue.

From a man aged 25. The head of the opposite femur is preserved, No. 1900.

Presented by Joseph Swan, Esq.

639. A hip-joint with similar disease. The synovial membrane is, in many situations on both the capsule and the neck of the femur, thickly beset with groups of pedunculated, leaf-like, branched and shreddy processes. The intervening

portions of the synovial membrane appear healthy. With the exception of that about the round ligament, nearly all the cartilage has been removed from the head of the femur and the acetabulum ; and much of the remainder is cracked and fibrous. The exposed surfaces of the bones are hard and smooth ; and the borders of the head of the femur are enlarged and covered with nodulated hard new bone.

From a woman 61 years old, who had been lame in this joint for many years, and in her last year of life had suffered much pain in it. The neck of the femur appeared unusually short, but was of healthy texture. There was a small cartilaginous and osseous tumour near the lower end of the tibia.

From the Museum of John Howship, Esq.

640. An astragalus, from the upper and lateral surfaces of which the anterior half of the articular cartilage has been removed, apparently by ulceration proceeding gradually from its free surface. The exposed bone is smooth, hard, and apparently healthy. The remaining cartilage (except in one situation, where there is a small shallow ulcerated depression on its surface) appears of healthy texture ; its ulcerated edges are gradually and very thinly bevelled towards the exposed bone, to which both they and the rest of the cartilage adhere, as in the healthy state. *Hunterian.*

641. A section of the lower end of the femur of a boy 10 years old. The articular cartilage has been extensively ulcerated on its free surface. The ulcers present two principal forms : one is that of broad, smoothly bordered and, for the most part, shallow depressions of the surface of the cartilage, as if portions of it had been chiselled off ; the other, that of numerous distinct circular pits or channels, not more than one fourth of a line in diameter, which penetrate obliquely into the substance of the cartilage. Some of these channels appear to reach the substance of the bone or of the epiphysial cartilage (for the ossification of the epiphysis is incomplete) ; and some are nearly filled with granulations ; they, all together, give the cartilage a peculiar worm-eaten appearance. The sides of the condyles, and the fossa between their posterior parts, are covered with thin layers

of lymph; and so is one of the larger depressed ulcers. The portions of cartilage remaining between the ulcers appear healthy.

The disease was of more than three months' duration. At first there was a small tumour, containing some fluid, just above the patella; but it had no appearance of being an inflammatory swelling, and there was only slight enlargement and tenderness of the joint. The tumour was opened, and some serum let-out: its cavity then suppurated, and an extensive abscess formed, which required to be more widely opened. A mass of *fungous* granulations protruded from the opening; hectic fever ensued, and amputation was judged necessary. Ten days after it was performed, though the progress of the stump appeared favourable, symptoms of affection of the brain ensued, with which, in ten days more, the child died.

The knee-joint, when first examined, contained some serous fluid. The cartilage of the patella was ulcerated, and its substance "partially necrosed." The ventricles of the brain were distended with nearly three ounces of serous fluid.

From the Museum of John Howship, Esq.

642. Section of the right knee-joint of a child, injected. The articular cartilages are removed to a great extent by ulceration extending from the diseased bone beneath them, and the epiphysis of the femur has a carious excavation immediately under the cartilage. A large abscess in the soft parts around the joint is partially exposed externally by the removal of part of the integuments.

Presented by John Hilton, Esq.

643. A right patella, with the articular surfaces of the tibia and femur, removed in excision of the knee-joint. The articular cartilages have been removed by ulceration, and are replaced by soft brownish granulations. The surfaces of the bones, especially that of the inner condyle of the femur, are ulcerated. There is an old sinus behind the external articulating surface of the tibia, apparently leading into the cancellous tissue of the head of the bone.

From an aged man, in whom the disease had existed several years.

Presented by Sir William Fergusson, 1871.

644. A portion of a diseased knee-joint. The cartilage over the inner condyle of the femur is extensively ulcerated. The synovial membrane is thickened, granular, and flocculent. The bone is unaffected.

From a girl aged 7, in whom swelling of the knee set-in during recovery from scarlet fever. The joint was blistered without benefit; and at the end of six months a bone-setter attempted to reduce a supposed dislocation. This aggravated the disease; and after several weeks, when abscesses had formed around the joint, it was excised, about eighteen months after the first appearance of swelling. A few weeks after the operation it was found necessary to remove some dead bone from the tibia. The parts then healed, and the patient was seen, four months later, in good health, with the leg quite firm.

Presented by Sir William Fergusson, 1871.

645. Seven lower, probably the lowest, dorsal vertebræ, with some of the adjacent parts. In the body of the first of the vertebræ is a deep and large excavation, with which several of smaller size, indicated by incomplete partitions, have coalesced. The walls and margins of the excavation are smooth, well-defined, and lined with a thin layer of false membrane, behind which is an appearance of small masses of tuberculous matter. The body of the second of the vertebræ is superficially ulcerated, and has one small deep cavity in its front part; that of the third is similarly ulcerated, and its remains are filled with small granulated masses of tuberculous matter; the bodies of the fourth and fifth are almost wholly removed by ulceration, but in their remains, as well as in those of the sixth and seventh, which are less extensively ulcerated, nearly all the cancellous spaces are full of tuberculous matter. The intervertebral cartilages are nearly all removed: but of some of them, portions, of the natural thickness, remain next the spinal canal; and of some, the superior and inferior layers are still firmly fixed to the bodies of the contiguous vertebræ. The ulceration, therefore, appears to have made its way from before backwards, and from the middle towards the upper and lower layers of the intervertebral substance. In neither case is there any curvature of the spine at the part from which the fibro-cartilages are removed.

Presented by Sir William Blizard.

646. A larynx, with the epiglottis and part of the trachea. The mucous membrane of the glottis is œdematous. The cricoid cartilage has become partially ossified and necrosed, its surface being blackened and detached from the perichondrium and surrounding tissues. An abscess, formed around it, has opened into the left side of the pharynx, between the cricoid and the posterior border of the thyroid cartilages. A piece of blue glass rod is placed in the aperture.

From a man, 47 years of age. He had suffered for nine months from inflammation of the throat and enlargement of the tonsils, and died from suffocation, apparently owing to the contraction of the aperture of the glottis.

Presented by Sir Stephen L. Hammick.

647. A large piece of cartilage and bone, of the shape and about half the average size of a patella, removed from a knee-joint. It may be regarded as a portion of one of the condyles of a femur, which, probably after injury, was separated by a process similar to necrosis, but without acute inflammation. The articular cartilage is thinly extended over the edge of the bone.

Presented by Sir Everard Home.

648. A piece of free cartilage also removed from a knee-joint. It is smaller than the preceding specimen, and uniformly thin, with a smooth surface, a portion of which has apparently been peeled off. It was probably separated by a similar process. *Hunterian.*

Other specimens of Diseases of Cartilage may be found by reference to the Indices of the Series of Diseases of the Joints, Vertebral Column, and Larynx.

Series XII. INJURIES AND DISEASES OF BONE.

Hypertrophy : 649 to 660.
Atrophy and Degeneration : 661 to 676.
Rickets ; Osteo-porosis : 677 to 715.
Infantile Syphilis* : 716 to 725 B.
Cretinism : 726 to 732 A.
Mollities Ossium : 733 to 746.
Fractures : 747 to 1114.
Inflammation of Bone and Periosteum : 1115 to 1573.
Tumours of Bone : 1574 to 1731.

Subseries 1. Hypertrophy.

Simple—compensatory or adapted : 649, 650, 651, 657, 658, 706.
Inflammatory : 659, 660 ; and many more among the specimens of Inflammation of Bone.

649. A vertical section of a skull of unusually small capacity. The anterior region of its cavity is especially diminished by increase of the diploe of the frontal bone, and sinking-in of the inner table. The middle part of the frontal bone is eight lines in thickness. There is a slight prominence of the frontal region of the skull externally. All the osseous tissue is healthy. The parietal bone is not thickened ; the coronal suture is obliterated. *Hunterian.*

650. Portion of a frontal bone increased, by the growth of healthy diploe, to a thickness of six lines. It is probable that in both this and the preceding case the hypertrophy of the skull was associated with atrophy of the brain.
Hunterian.

651. Portion of the parietal bone of an idiotic woman thickened

* Certain bones affected with congenital syphilis are here placed on account of the general likeness of the pathological appearances presented by them to some cases of rickets and the diseases thereto allied. Perhaps these changes occur in children in whom rickets and syphilis coexist.

by the increase of coarse but healthy diploe. The tables are natural in both thickness and texture.

From the Museum of R. B. Walker, Esq.

652. The upper part of a skull (marked "Mr. Ferguson"), increased in weight and thickness. The chief increase is in the frontal bone, the section of the middle and lower portion of which is eight lines thick. The increase of thickness is entirely in the diploe; and the internal table of the skull is pushed inwards, so that the anterior region of the cranial cavity is diminished to an extent which is not indicated by the form of the unaltered external table. The internal surface of the skull is deeply marked by the vascular grooves and apertures; and on the interior of the frontal bone are several irregular circumscribed depressions, such as might be formed by large Pacchionian glands. There are fewer and smaller depressions of the same kind on the inner surface of the parietal bone. The upper border of the frontal bone forms, in the middle line, an angle of about 140°, which is received between the anterior borders of the parietal bones; and the temporal ridges are prominent and unusually approximated to the sagittal suture. The sutures are not obliterated. *Hunterian.*

653. Section of the upper part of a skull of unusual weight and thickness. Nearly the whole of the increase is in the situations of the original centres of ossification of the frontal and parietal bones; and it is due chiefly to an augmentation of the diploe, which is hard, heavy, and, on the cut surface of the parietal bone, three lines and a half in thickness. The thickening of the skull is much more obvious on its internal than on its external surface; and the former is marked deeply by the grooves for blood-vessels. The sutures are scarcely traceable internally. *Hunterian.*

654. The skull of a native of India, showing extreme hypertrophy. The occipital bone, near its protuberance, is over half an inch in thickness. The diploe is completely replaced by compact tissue; the frontal and sphenoidal

cells are well developed; the cancellous tissue of the basilar process and the body of the sphenoid bone remains unaltered. The hard palate is very thick; the bony septum of the nose and the spongy bones are much harder than usual. The sutures are open. Upon the left side of the frontal bone is the cicatrix of an injury. The lower jaw, especially the horizontal portion, is extremely thickened and heavy, and its external surface is irregular. The weight of the entire cranium is 59 oz. av.

From the Collection of Dr. J. Barnard Davis, No. 697.

655. The right half of a skull, the upper and lateral walls of which are generally and almost uniformly thickened. The greatest thickness is at the middle of the right half of the frontal bone, the section of a portion of which, cut out with a trepan, measures five lines. The increase is chiefly owing to the augmentation of the diploe, and is accompanied by a decrease in the capacity of the skull. The texture of the diploe is hard and heavy, and the cancellous spaces are small. The tables of the skull are thick, somewhat rough and porous; and their lines of boundary from the diploe are obscure. The interior is deeply marked with vascular grooves and apertures. *Hunterian.*

656. Section of the upper part of a skull thickened, indurated, and increased in weight. The median part of the frontal bone is six lines in thickness, of which thickness the diploe occupies rather more than four lines. The coronal and sagittal sutures are obliterated internally; and in the course of the former there is a considerable depression on the exterior of the skull. In other respects the skull resembles that numbered 653. *Hunterian.*

657. A left tibia and fibula, showing the ordinary manner of distortion in consequence of rickets. Both are strongly curved forwards and inwards, and are much flattened antero-posteriorly. Their concavities are strengthened by thickening of their posterior walls; the increased thickness is due to the growth of healthy compact bone.

Presented by Gilbert B. Macmurdo, Esq., 1868.

658. The right femur, tibia, and fibula of an adult, exhibiting changes consequent upon rickets in early life, and, like the preceding, showing the compensatory hypertrophy of their walls in the concave part of their curves.

659. A vertical section of a femur, other portions of which are described in No. 195. It may be regarded as an example of inflammatory hypertrophy. The tissue of the walls, after expansion or swelling, has been consolidated into a nearly uniform substance, as heavy, hard, and almost as compact as ivory. The consolidation is less complete below than in the upper half of the shaft: in the former situation the walls are three quarters of an inch thick, and two thirds of their inner part consist of coarse cancellous tissue; of the outer wall in this situation part is similarly coarsely cancellous, but a greater part is solid. The medullary cavity is narrowed by the encroachment of the inner layers of the walls; and all the inner part of the walls of the shaft is covered with hard coarsely laminated new bone.

Presented by Sir William Blizard.

660. A tibia with a circumscribed elevation of new bone formed beneath an ulcer of the integuments. Though retaining its original form, the new bone has lost the porous, finely cancellous texture usually found in bony growths under ulcers over the tibia: it is hard, and most of the vascular apertures by which its surface was perforated are closed. It is probable that the ulcer, beneath which the growth of bone was formed, had healed over it. There is a general growth of new bone, which has also become hard, over all the posterior surface of the tibia. *Hunterian.*

Among the specimens of Hypertrophy of Bone in the Museum are Nos. 5 to 7, 11, 16, and many specimens of inflammatory hyperplasia in Subseries 3.

Subseries 2. Atrophy and Degeneration.

Wasting—Simple Atrophy: 661 to 676; 1221, 1222.
From disease: 661, 662, 663; 1220, 1221, 1222, 1267, 1889.
Congenital? : 664.
In the insane: 664 A.
From deficient blood-supply: 669.
From constant pressure: 670 to 675.
Senile: 676.
Rickets and allied Diseases: 677 to 715; 1239, 1240.
Skeletons, showing characteristic forms of rickety bones: 677, 678, 679.
Changes of Structure: 681 to 694, 710 to 715.
Changes of Shape: 695 to 732.
With fractures: 1032, 1033. [And see in following Index]
In the upper extremity: 695 to 698.
In the pelvis and lower extremity: 699 to 707.
In animals: 708 to 715.
Infantile Syphilis *: 716 to 725 B.
Cretinism: 726 to 732 A.
Mollities Ossium.
Osteomalacia; Halistenosis; with some of Fragilitas Ossium: 733 to 746.

Subdivision A. *Simple Atrophy.*

661. A vertical section of the bones of a knee-joint which had undergone atrophy from more than three years' inaction. The femur and tibia are united by bone at a right angle, and the patella is united to the front of the outer condyle of the femur. In its thickest part, the wall of the femur is only half a line in thickness; in most situations, both it and the walls of the tibia and fibula are not more than one fourth of a line thick; and in the walls of the tibia there are several large holes produced by the gradual thinning. In the cancellous tissue of the femur and tibia, the naturally closely-set lamellæ are replaced by a few long and slender filaments of bone forming a wide network. The cancellous tissue of the patella is healthy. The bones are slightly reduced in size: their external surface appears healthy but very greasy.

From a girl, aged 19, in whom, three years before her death, a rheumatic affection involved all the principal joints. For two

* See footnote, p. 36.

years she was bedridden and neglected. During the four months preceding her death from a pulmonary complaint (tuberculosis and empyema), she lay constantly in one position, on her back with the thighs much abducted and flexed, the legs bent at right angles to the thighs, and the feet everted. After death the vertebræ, the bones of one arm and those of both lower extremities were found to be extremely atrophied. The calvaria was healthy; several of the joints were stiff through fibrous ankylosis passing into the osseous form. See "A Remarkable Case of Eccentric Atrophy of the Bones," by John Thurnam (London Medical Gazette, vol. xxiii. p. 119).

Presented by Dr. Thurnam, 1871.

661 A. The shaft and lower part of the left tibia from the same patient as the preceding specimen. Externally the bone appears healthy; but the section shows that the compact tissue of the shaft is reduced to less than a sixteenth of an inch in thickness; its cancellous tissue has completely disappeared, excepting immediately above the lower epiphysis, which has lost the layer of compact bone naturally covering its articular surface. The entire tibia, when dried, weighed one ounce and three eighths.

Presented by Dr. Thurnam, 1871.

662. A portion of the lower extremity of a right femur, and a tibia and fibula, all of which have undergone atrophy to an extreme degree. The cancellous tissue, with the exception of a few scattered bands, has disappeared entirely from the articular extremities of the bones; and the compact walls are reduced to an extremely thin layer of bone, which can be bent like paper, and which is fenestrated in all directions by larger and smaller apertures. The compact walls of the shafts are very thin, and, for the most part, transparent. The articular ends and the enlarged medullary cavities of the bones were filled with soft fatty medulla of a yellow colour and, in places, of oily consistence. The patella is fixed to the external condyle of the femur; it presents changes similar to those in the other bones.

The bones were removed by amputation from a young man, who, ten years before, had suffered from caries of the bones forming the left ankle-joint, and afterwards of those of the right ankle-joint; subsequently an abscess formed near the right knee-

joint. For the last two or three years he had been bed-ridden. When he came under observation, the lower extremities were symmetrical in length and in the size of the bones; but the soft parts of the right leg were swollen and œdematous, and the right knee was ankylosed in the flexed position. The muscles of the right limb had also undergone extreme fatty degeneration. His urine contained much albumen and some blood. (See Trans. Path. Soc. vol. xxxiii. 1882; also MS. Notes, vol. iii. p. 186.)

Presented by Francis R. Cross, Esq., 1881.

663. A femur extremely atrophied, probably in consequence of inaction of the limb. Its size is diminished in every part, but more in the shaft than in the epiphyses and processes. The tissue of the wall of the shaft is hard and healthy; but that of the two extremities is so thin and dry that it easily yields to pressure. *Hunterian.*

664. The base of a skull, of which all the bones are exceedingly thin and light. The body of the sphenoid is much atrophied; the posterior clinoid processes are scarcely developed; the lesser wings, with the anterior clinoid processes, were altogether absent, or were so delicate as to have been lost in maceration; and the posterior portions of the greater wings are so deficient as to leave on each side a large aperture, in which are included the foramen lacerum medium, the carotid canal, the foramen ovale, and the foramen spinosum. The foramen magnum is unusually large. The skull is somewhat distorted, its posterior part being twisted to the left, and the right condyle being lower than the left. Very numerous and complex ossa triquetra are developed in the lambdoidal suture, especially on the left side. The bones of the face are atrophied in a manner similar to those of the cranium.

From a youth, 19 years of age, who entered the naval service about three months before his death. He was considered by his fellow-seamen to be "half-witted." He seldom went into his hammock, but lay on deck between the guns, and never washed unless threatened with punishment. His intellect continued to diminish; and at length, his habits becoming more dirty and his person offensive, he was flogged. Large sloughs upon the sacrum, nates, and back resulted. He was then sent to hospital, where, having become comatose and passing fæces and urine involuntarily, he died in three days. His friends stated that he was able to read

and write and take care of himself, and that, although always delicate, he had no deficiency of intellect before going to sea.

Presented by Sir Stephen L. Hammick.

664 A. Portions of the ribs from ten different patients who were inmates of an asylum, suffering from various forms of insanity. All these ribs are very light, thin-walled, unusually brittle, and have wide cancellous spaces. In most of them the amount of animal matter exceeded that of the earthy :—

2847 A *a*. From a woman aged 70, with chronic mania.
Analysis. Animal matter 72·73.
Mineral matter 27·27.

2847 A *b*. From a woman aged 73, with melancholia.
Animal matter 56·87.
Mineral matter 43·13.

2847 A *c*. From a woman aged 65, with dementia.
Animal matter 55·15.
Mineral matter 44·85.

2847 A *d*. From a small sickly female idiot, aged 23, and unable to walk. The ribs, when fresh, were very soft and easily bent.

2847 A *e*. From a woman aged 70, with senile dementia. The ribs were very fragile; the cranial bones thickened.

2847 A *f*. From a man aged 38, who died of general paralysis of three years' duration. The ribs were very light.

2847 A *g*. From a female aged 54, with epileptic dementia; she died of cancer of the liver.

2847 A *h*. From an epileptic female aged 46; she had amyloid disease of the liver and kidneys. The ribs were soft and easily bent.
Animal matter 55·17.
Mineral matter 44·83.

2847 A *i*. From a man aged 48, with general paralysis. "Skull very thick, in some places fully half an inch. Ribs all very brittle. Great deficiency of osseous tissue, with increase in the medullary substance."

2847 A *j*. From a man aged 51, with "mania of many years" standing. Died with fatty heart and tuberculosis of the lungs. The ribs were large and rather heavy, but very brittle.

For a fuller account of these specimens, see 'Journal of Mental Science,' vol. xix. p. 160.

Presented by Dr. J. W. D. Williams, 1880.

665. The upper part of a femur, of full size, but remarkably light. The vascular canals in the walls of the shaft are numerous and large; and on part of the neck the compact tissue is so diminished that there remains only a finely porous osseous substance. *Hunterian.*

666. A left femur, somewhat more than usually curved forwards in its upper part, and very light, though the general appearance of its tissue is not changed. The head and neck are small; and their axis forms, with that of the shaft, an angle less obtuse than is natural. *Hunterian.*

667. A tibia, not unhealthy in appearance, but very light. The compact tissue forms so thin a layer round its articular extremities that they may be crushed by the pressure of the fingers. *Hunterian.*

668. Atrophied bones of a child's foot. Portions have been cut from them with a knife; and the cut surfaces are smooth and scarcely broken. The walls are very thin: in the thickest part of the os calcis they are less than half a line in thickness; and at the articular surfaces their sections can hardly be discerned beneath the cartilages, which are, proportionally, rather thick. The cancellous tissue is light; its spaces are large, and filled with a yellow, apparently caseous material; and the lamellæ and filaments of bone which surround them are coarse and thick.

From the Museum of George Langstaff, Esq.

669. Section of a femur which was fractured through its middle third, below the canal in which the great nutritive artery traverses its wall to the medullary tissue. The upper portion lies in front of the lower one, but is firmly united to it by new bone formed between them and at their sides. The section shows that in the lower portion (which was deprived, by the fracture and displacement, of its supply of blood through the nutritive artery) the walls are atrophied and,

consequently, thinner than those of the upper portion. The cancellous tissue in the lower portion is also very light and delicate.

From a man 30 years old. The fracture occurred four years before death. See No. 676.

Presented by Thomas Blizard Curling, Esq.

670. The first bone of a sternum, on which, near its articulation with the first left rib, there is a deep cavity, the consequence of the wasting produced by the pressure of an aneurism.

Hunterian.

671. The second bone of a sternum, part of the posterior surface of which has been absorbed in consequence of the pressure of an aneurism. In neither this nor the preceding preparation is there any appearance of ulceration of the bone; its tissue has grown, though less quickly than it has been removed, and, retaining a healthy structure, has been modelled to the form of the body pressing on it.

Hunterian.

See Nos. 31 & 31 A.

672. The upper part of a skull. At the anterior border of the right parietal bone, on the inner surface, there is a deep circular cavity, an inch in diameter, which appears to have been formed in consequence of the growth of a tumour from the brain or dura mater. Its surface is smooth and hard, like that of the rest of the inner table, and is grooved in adaptation to some of the branches of the middle meningeal artery. At the middle of the depression the whole thickness of the skull is penetrated. A slight elevation is discernible on the corresponding part of the exterior of the skull.

673. The skull of a Sheep in which, in consequence of the growth of hydatids in the brain, the parietal and parts of the frontal and temporal bones have become very thin, and are in three situations perforated. The tumour formed by the protrusion

of the parts from within the skull through these apertures had nearly opened externally.

Presented by Sir Joseph Banks.

674. The upper part of the skull of a *giddy* Sheep, in which are several small apertures produced by the pressure of hydatids growing within the brain. The texture of the bone around the apertures is healthy; the diploe is not exposed in the thinning and perforation of the skull. *Hunterian.*

675. The upper part of a Dog's skull exhibiting atrophy, probably consequent on the pressure of hydatids. It is everywhere thin, though not enlarged, and in three places is perforated by apertures which have sharp edges and are closed by membrane. *Hunterian.*

676. Section of an atrophied humerus from an old person. The shaft is generally reduced in size; and the neck of the bone appears rather shorter than is natural. The walls are thin but hard; the spaces in the cancellous tissue are large, and filled with fatty matter, indicating an increased quantity with, probably, a morbid quality of the fatty matter in this part of the bone. The border of the lower articular surface has an overhanging lip.

The specimen is represented in the 'Medico-Chirurgical Transactions,' vol. xx. pl. 5, in illustration of a paper at p. 44. The other section is in the Museum of the London Hospital.

Presented by Thomas Blizard Curling, Esq.

Subdivision B. *Rickets and Osteo-porosis.*

677. The skeleton of an adult Spaniard affected with rickets. It measures three feet eleven inches in height; and the bones appear to be of natural strength and firmness. The head is of average size, and well formed. The vertebral column presents a double curve; the upper curvature, formed by the dorsal vertebræ, has its convexity directed obliquely forwards and to the right; in the lower one the lumbar vertebræ are directed with a convexity backwards and to the left. The sacrum also is slightly curved, its apex being directed towards the left side. The vertebræ are of healthy texture; those in the upper curve have the left sides of their bodies turned forwards, and those in the lower curve their right sides so turned; and, in both, the sides thus turned forwards are less deep than those turned backwards and lying on the convexity of the curve. The chest is nearly symmetrical; but both its vertical and its antero-posterior diameters are, in consequence of the deformity of the spine, much below the average dimensions. The ribs are short, wide, and nearly horizontal—those on the left side being, at and about their angles, closely crowded, but divergent as they come forwards. The sternum is of natural form and size. The ossa innominata are obliquely placed, in adaptation to the curvature of the spine; the brim of the pelvis is slightly narrowed by incurvation on both sides, but especially on the left side, opposite the acetabulum; and the lower aperture of the pelvis is narrowed by the approximation of the tuberosities of the ischia. The scapulæ and clavicles are well formed, but rather short. The humeri are only nine inches long: their heads are large, light, and oval, their longer axes being directed from without inwards. The tuberosities also are large and broad; the deltoid ridges strongly marked; the shafts of full thickness, and their posterior surface at the upper part very broad and flat. The left elbow-joint, forearm, and hand appear well formed, so do the right forearm and hand; but in the right elbow-joint the forearm is nearly fixed at right angles to the humerus, the condyles of which have acquired imperfect

articular surfaces on their anterior aspects. The femora are only nine inches high ; the tibiæ and fibulæ twelve inches ; and all these bones present the changes of form characteristic of rickets, and described in several of the following specimens. The feet are of natural shape.

Purchased, 1846.

678. The skeleton of a man, aged 35 years, with extreme lateral curvature of the spine and rickety curvature of the bones of the lower extremities. The spine has a well-marked curve to the left and posteriorly in the dorso-lumbar region, the point of greatest convexity being at the twelfth dorsal vertebra. There is a slight curve in the lumbo-sacral region, in a direction opposite to that of the dorsal curve; its central point is at the sacral promontory. A slight lateral deviation to the right side is also observable in the cervical region. A line dropped vertically from the promontory of the sacrum falls a little behind what appears to be the centre of gravity of the skeleton ; and the extreme of the dorsal curve is five inches behind this line. With the lateral curvatures there is an extreme rotation of the bodies of the vertebræ, varying in relation to the direction of the different curvatures. Commencing at the coccyx, the lower part of which is turned to the right, a small turn to the left in the lower part of the sacrum follows. The upper part of the sacrum looks directly forward; and from the beginning of the lumbar region there is a gradually increasing rotation of the vertebræ from right to left as high as the eleventh dorsal vertebra, where the bodies have taken a half turn, and the right articular processes are directed forwards. From this point the column untwists itself, till at the fifth dorsal the bodies regain their natural position. Lastly, the cervical vertebræ are slightly rotated ; but this is hardly so apparent as to be insisted on.

The thorax is thrown forwards, and anteriorly it is barrel-shaped ; the left lower ribs are unusually long and at their angles are sharply curved backwards, downwards, and then forwards around the outwardly projecting and rotated vertebræ.

The pelvis is slightly oblique ; and the left half is less expanded than the right. The extreme rotation of the vertebræ may have

converted a lateral curve into an antero-posterior one, or nearly so; and to the strong inclination of the dorso-lumbar curve backwards the slight extent of the compensatory curves above and below it must be attributed.

From a Dissection-subject, 1873.

679. The skeleton of a child, about 7 years old, exhibiting some of the deformities produced by rickets, together with the results of extreme fragility of the bones. There is a slight lateral curve in the upper dorsal part of the spine; and the chest projects forwards and is flattened laterally, with incurvation of the sternum and many of the ribs. The front of the pelvis is *beaked*, by the approximation of the acetabula, and the rami of the ischia are nearly parallel; the lower half of the sacrum is directed straight forwards. The femora are curved forwards, and the tibiæ and fibulæ slightly inwards. Besides these deformities, which may be ascribed to rickets, many others appear due to fractures of the bones united with displacement. The whole number of fractures is forty-two. The right clavicle is broken in one, and the left in three places; on the right side all the ribs, except the twelfth, are broken in one, two, or three places, and on the left side all except the last three: both the humeri, radii, and ulnæ are fractured. The fractures are chiefly transverse; and most of them are united; but there is scarcely any accumulation of new bone about them. The disease of the bones, by which the fractures were preceded, appears to have been like that shown in Nos. 711, 714; they are light, spongy, friable, and fragile, and their walls appear very thin. They are as long as natural, and, except in their curvatures, are not deformed as in rickets.

From the Museum of Professor Himly, of Göttingen.

679A. The thorax of a rickety infant, aged 12 months, exhibiting in a marked degree the deformity known as "pigeon-breast." The sternum and costal cartilages are thrust prominently forwards, and there is a deep furrow on each side caused by an inbending of the ribs and cartilages at their junction. The ribs are acutely bent forwards and inwards at their angles; and the eighth and ninth ribs on the right

KINGS COLLEGE LONDON

side, and the seventh and eighth on the left, have been "spontaneously" fractured at this point. At the level of these ribs, and those immediately above and below them, the furrows are deepest. (See Trans. Path. Soc. vol. xxxiii. 1882.)

Presented by Robert W. Parker, Esq., 1881.

680. One half of a femur which is curved anteriorly as the result of rickets. The curvature is almost entirely confined to the lower third of the shaft. The line of ossification at the lower extremity is irregular, and at one point a long process of partially calcified cartilage passes upwards into the osseous tissue from the intermediary cartilage. A similar condition is observed at the upper extremity of the bone. The compact walls of the shaft are thin, especially at its lower third, where they are of extreme tenuity. The medulla appears soft.

Presented by Charles Stewart, Esq., 1881.

681. Sections of part of a boy's femur, which was fractured several years before death. The fractnre occurred near the upper third of the bone ; and the portions are united at a right angle. The medium of connection is a large quantity of spongy osseous tissue, accumulated at the posterior surface of the bone within the angle formed by its two portions. The ends of the fractured portions are closed by osseous substance. Both above and below the fracture the bone is atrophied ; its walls are very thin, and their lamellæ are separated ; the greater part of the lamellæ of the cancellous tissue of the shaft have been removed. The head and neck of the femur are light and spongy ; and the lamellæ of the cancellous tissue near the trochanters are thicker and less numerous than usual.

At the time of the fracture the child was suffering with rickets. He was born deaf and had always been very delicate. At death the other femur (though it had not been fractured) and the two humeri were nearly as much bent as this.

From the Museum of George Langstaff, Esq.

682. The clavicle of a rickety child, aged 3 years, divided into halves by longitudinal section. It is shorter than a normal clavicle at that age, the shortening being partly due to unnatural increase of the acromial curve. It is also much enlarged and rounded ; and the cancellous tissue is porous, with wide cancelli. *Presented by Dr. Thurnam*, 1871.

683, 684. Two femora, from a person of nearly adult age, the upper epiphyses being completely, the lower nearly; united. They are similarly and symmetrically altered; and both exhibit the effects of rickets partially recovered from. The upper and middle thirds of their shafts are curved forwards, and laterally compressed; and the *linea aspera* at this curved part projects far backwards, its posterior margin forming the chord of the arc which is formed by the anterior wall of the femur. All this part of the bone appears of healthy texture, but is hard and heavy. The heads and necks of the femora, also, are healthy, except in that the surfaces of the necks are rather rough, and their lower borders appear swollen, bulging downwards a little. The greater part of the surface of the lower third of each femur presents the same rough, coarse woollen-cloth-like appearance as is shown in the osteo-porotic bones of the lion which Hunter described as "rickety" (Nos. 712–13). A part of the anterior surface between and above the condyles is free from this change ; and this part is of exactly the same form and extent in both the bones. *Hunterian.*

685. The frontal bone of an infant which had rickets. The greater part of the bone is thickened, and converted into a light, dry, finely porous and friable tissue, the external surface of which (like that of the preceding specimens) is rough, resembling the surface of coarse woollen cloth, and slightly raised above the more healthy part. The change of structure affects exactly symmetrical portions of the two lateral halves of the frontal bone, and appears to have made progress from its circumference towards its original centres of ossification ; for these centres, together with a space of irregular shape around them, are free from the

disease. On the inner surface of the bone the same change of structure, though in a less advanced stage, is more generally diffused; and the whole thickness of the bone appears, at least in some parts, to be similarly diseased.
Hunterian.

686. The upper part of the skull of a child, about 4 years old, diseased similarly to that just described; but the disease is more advanced in both degree and extent. The bones are in some parts six lines in thickness; the tissue of both their surfaces and their interior is nearly all converted into a uniform, light, and finely cancellous substance; and, except on some parts of the interior of the skull which were adapted to spaces between the cerebral convolutions, there are no remains of the compact tissue. The fontanelles are not closed. *Hunterian.*

687. Part of a skull, in which the frontal and parietal bones, in consequence probably of rickets, are very thin and light, and throughout greyish, dry, and friable. Their external surface has a fibrous appearance, like that of coarse woollen cloth. The capacity of the skull appears to have been very small. *Hunterian.*

688. Fragments of the frontal and parietal bones of an adult, which, probably by the further advance of disease like that shown in the preceding specimens, have been increased to a thickness varying in different parts from half an inch to an inch. Their texture is almost uniform, portions only of the tables retaining traces of their compact texture. The bones are throughout very finely cancellous, the cells being small and irregular in form, their boundaries thick and in many parts formed by tortuous lamellæ. In general texture the bones are brittle, and portions of them may be easily rubbed into a coarse powder; their weight is increased, but not in proportion to their bulk. The remains of the inner and outer tables are uneven, and perforated by numerous apertures for vessels; the grooves for the meningeal arteries are large and deep; the sutures are obliterated: in some parts appear traces of deep ulceration. The cavity of the skull appears not diminished. *Hunterian.*

689. The upper part of a skull increased in thickness and weight. The chief increase is in the frontal and occipital regions, of which the bones are between five and six lines in thickness. The thickening is accompanied with a considerable decrease in the capacity of the skull, which decrease is indicated externally by the flatness of the frontal and superior occipital regions. The external surface of the skull appears finely porous, being perforated by numberless minute foramina; on the internal surface the vascular grooves are very deep and numerous, and a similar, but more coarsely, porous appearance is produced by the number of larger apertures perforating it. The parietal foramina are upwards of a line in diameter. There is no clear distinction between the tables and the diploe; both tables are converted into a nearly uniform, heavy and hard texture, and, except on the surface, there is no trace of their compact tissue. The sutures are obliterated. *Hunterian.*

The changes may be regarded as the results of a process of induration subsequent to, and in a measure reparatory of, a state of the bone similar to that shown in Nos. 685 to 688—an induration which appears to have been accompanied with thickening of the walls of the cells, till their cavities were reduced to minute pores.

690. A small circular piece of a skull, similarly thickened and indurated. *Hunterian.*

691. The greater part of a skull, of which all the bones, but especially those composing its vault, are remarkably thickened. A large portion of the posterior and upper part of the skull has been broken away; and the edges of the bone thus exposed have a thickness varying from three quarters of an inch to an inch and a quarter. The whole of the parietal and a great part of the frontal bones are of the same thickness: the squamous portions of the temporal bones are half an inch thick; but below them the thickness gradually decreases towards the middle of the base of the skull, where the bones are much less altered in size. The superior maxillary, malar, and sphenoid bones are thickened, but less than the bones of the cranium. The tissue of all the bones of the upper part of the skull is converted into a

nearly uniform, finely cancellous, dry, porous, and friable though hard substance, of less specific gravity than that of a healthy skull. Their surfaces (the compact tables remaining in but few parts) are perforated by numberless apertures, those on the external being much smaller than those on the internal surface; the grooves for the blood-vessels are very deep; and all the sutures of both the face and the skull are obliterated. In the bones of the face the same porous change is less distinctly marked. By the thickening of their walls, the cavities of the skull and the orbits are considerably diminished. That of the former is especially diminished in its depth, measuring in its antero-posterior diameter about seven inches, in its transverse diameter five inches, in its vertical diameter three inches and three quarters, taking the extreme points of each.

The skull was found in digging a grave in the churchyard of Stepney, near London, and was given to Mr. Hunter by Mr. Patton, surgeon, of Ratcliffe Cross.

Hunterian.

692. The upper part of a skull, increased in thickness in every part, but especially in the frontal region, where it is from six to eight lines in thickness. This increase is accompanied by a corresponding decrease in the capacity of the skull, and by a change of structure of the bones, which may be ascribed to a process of hardening following, and in some degree repairing, the porous change displayed in the preceding specimen. Except on some parts of the surface, there is no discernible distinction between the tables and the diploe; they are converted into a nearly uniform, hard, and finely porous texture. The inner surface of the skull is more coarsely porous and perforated by larger apertures for blood-vessels than the outer surface; it is also deeply grooved by channels for the meningeal arteries. All the sutures are obliterated. *Hunterian.*

693. A parietal bone, ten lines in thickness, very hard and heavy, with thick rounded margins, and apparently very nearly solid. It has a remarkably chalky or limestone aspect. It is probably a portion of a skull which was diseased like

No. 691, then became indurated and consolidated like that last described, but in a greater degree, and, lastly, acquired its present fossil-like appearance by being long buried in a lime soil. It was found in the Hunterian collection of fossils, marked, in a foreign handwriting, "Antropolithus, s. Craniū humanū, locus incertus." *Hunterian.*

694. The anterior wall of the thorax, apparently of an old person, with "pigeon-breast." The manubrium sterni is almost horizontal; and immediately below the junction with it the gladiolus presents an extensive and gradual anterior curvature extending as low as the sixth rib, where there is a depression caused by a slight posterior curvature of the bone. The ensiform cartilage is ossified. The true costal cartilages are bent suddenly backwards, and those of the lower true ribs are longer and incline more obliquely downwards than normally. The ribs also pass almost straight backwards to the spine, and thus occasion the flattening of the side walls of the thorax. Most of the costal cartilages are partially and the lower ones completely ossified.

695. A right humerus, from an adult, of which, in consequence of rickets, the upper part of the shaft is slightly curved outwards. Its tissue does not appear unhealthy; but it is altogether of small dimensions. *Hunterian.*

696. The left humerus of the same person, similarly curved. *Hunterian.*

697. The left humerus of an adult, the whole shaft of which, in consequence of rickets, is considerably curved outwards. Its tissue appears healthy, and the parts for the attachment of muscles are well developed. *Hunterian.*

698. An adult femur, of which the shaft is more than usually curved forwards; its tissue, though rather light, appears healthy; and its neck has its natural obliquity. *Hunterian.*

699. An adult femur, the shaft of which, in consequence of rickets, is a little more than usually curved forwards. It is somewhat enlarged in the upper third and its whole tissue is very heavy. The axis of the neck forms a right angle with that of the shaft, and the head is below the summit of the great trochanter; but the substance of the bone is healthy. *Hunterian.*

700. An adult femur, similarly diseased. The linea aspera is very prominent, and the inner border of the shaft is sharper than is natural. The axis of the neck forms little more than a right angle with the shaft. The internal condyle is placed more than usually backward, and the external one is proportionally prominent, so that the lower part of the shaft looks as if it had been twisted round; an appearance less distinctly seen in the specimen last described. All the osseous tissue appears healthy. *Hunterian.*

701. A right femur, exhibiting almost exactly similar changes. The bone is small and slender in all its parts, especially at its articular portions; but its tissue appears healthy. *Hunterian.*

701 A. The left femur of the same person, similarly and symmetrically changed. *Hunterian.*

701 B. The right tibia and fibula of the same person. Both of them are curved forwards and inwards, and their shafts are much flattened, that of the fibula being, at one part, an inch wide and about three lines in thickness. The tissue of both bones appears healthy; and their extremities, though they seem to have been unusually greasy, are natural in form and size. *Hunterian.*

701 C. The left tibia and fibula of the same person, similarly and symmetrically changed. *Hunterian.*

702. The femora, tibiæ, and fibulæ of an adult, exhibiting changes consequent upon rickets in early life. The right femur is curved forwards, and its neck depressed so as to form little more than a right angle with the shaft; the linea aspera is

developed into a very prominent ridge. The left femur has been fractured through the lesser trochanter; the upper fragment is firmly united to the lower, but is rotated so that the great trochanter points backwards and the head of the bone somewhat downwards and forwards. The tibiæ and fibulæ are curved, and on the left side have been broken about the middle, but have united with scarcely any distortion. The bones are very greasy; but otherwise their texture appears healthy. A small exostosis projects from the posterior surface of the left tibia, just below the upper epiphysial line. *Presented by Sir Stephen L. Hammick.*

702 A. A rickety femur from an adult, with changes of form similar to those observed in the preceding specimens. Its condyles are much flattened, especially the internal, and the external condyle extends much lower than the other, so that the articular surfaces look inwards and downwards.

Presented by Gilbert W. Macmurdo, Esq., 1867.

703. A tibia, the shaft of which is curved inwards in consequence of rickets; but its tissue appears healthy. *Hunterian.*

704. A tibia, of which the shaft, from the same disease, is curved forwards and inwards, and remarkably flattened, its inner and outer surfaces being in nearly parallel planes. The shaft is increased in density; the extremities are more than usually greasy. *Hunterian.*

705. A tibia and fibula, the shafts of which, in consequence of rickets, are remarkably curved inwards and flattened. At the most prominent part of its curve, which is just above the junction of its middle and lower thirds, the shaft of the fibula is an inch and a quarter in width, but not more than two lines in thickness. Just below this part an irregular process of bone has grown from the outer border of the tibia, and is received in a corresponding cavity on the inner border of the fibula, so as to form a kind of false joint between them. There is a similar smaller growth on the inner margin of the tibia. In other respects the bones are healthy.

Hunterian.

706. Vertical sections of a tibia and fibula, similarly but rather less curved forwards and inwards. They exhibit a great increase in the thickness of that part of the walls of the shafts which lies in the concavity of the curve formed by them: in the tibia the thickness of the wall at the most curved part is five lines, while that of the wall which forms the convexity is only two lines; in the fibula the thickness of the wall is, in the concavity, about four lines and a half, in the convexity one line and a half. The increased thickness of the wall has taken place, chiefly, at the expense of the cancellous tissue, the lamellæ of which have been thickened and consolidated, and in this state annexed to the wall. Adjacent to the curved part the cancelli of the medullary tissue are very large. The shortness and flattening of the shafts of these bones make their articular extremities appear disproportionately large; but they are not absolutely larger than in ordinary bones of adult skeletons.

707. A pelvis, with rickety femora, tibiæ, and fibulæ. The pelvis, both in tissue and in dimensions, appears healthy. The other bones present the same kinds of deformity as those last described. The necks of the femora are short, the shafts curved forwards, the lineæ asperæ very prominent. Below, the shafts expand more suddenly than in the natural state to form the condyles; and thus the articular extremities, though not of unusual dimensions, appear disproportionately large; the outer condyles also are more prominent than is usual. The tibiæ, besides the ordinary curvature forwards and inwards, have a slight double lateral or *clavicular* curvature; and both of them have small spinous growths on their inner margins near their heads.

708. An incomplete skeleton of a Monkey (*Cebus apella*), with some of the bones affected with rickets. The bones of the forearm and leg are greatly curved.

Presented by the Zoological Society, 1867.

709. The skeleton of a rickety Cat. All its parts appear well formed except the spine and extremities. In the middle of the dorsal region the spine is bent towards the sternum and,

without any lateral curvature, forms a right angle directed downwards. The texture of the bodies of the vertebræ is not discernibly altered; but they are small, their posterior parts are decreased in depth, and the spinous processes are small and closely approximated. The ribs connected with this part of the spine are curved far upwards and outwards; and by this compensation, and the consequently increased width, the cavity of the chest has acquired full dimensions, though encroached upon by the incurved spine. The scapulæ are short, convex, and thick; the humeri short, thick, and curved forwards; the radii and ulnæ less shortened and curved forwards, but at their most curved parts flattened, thin, and very wide. The pelvis is short, and all its bones are thick; its posterior and lower part is curved forwards, the acetabula are approximated, and the whole of its outlet is narrower than is natural. The femora, tibiæ, and fibulæ are thick, short, and curved forwards, but in a less degree than the bones of the anterior extremities.

710. Sections of the ulna of a Monkey. Scarcely any trace of the outer compact layer of the wall remains; its surface is in some parts minutely porous, in others composed of finely reticulated fibres. The sections present appearances of laminæ composing the wall, but separated from each other, as if the tissue they once formed had been expanded; and in the place of the cancellous tissue there is a nearly uniform, delicately filamentous, osseous substance, the cut surface of which is just like that of rather coarse woollen cloth. A similar osseous substance has been formed around the upper part of the shaft of the ulna; the whole of which is light, and so friable that it might be easily crushed between the fingers. *Hunterian.*

711. Numerous bones of the same Monkey as those in No. 710. They exhibit changes like those last described, but in a more advanced form. They are all large, very light, finely porous, and friable, with scarcely a trace of compact tissue. The bones of the upper part of the skull are five lines in thickness; and there is scarcely any distinction between the tables and

the diploe, except that the surfaces of the former are smooth and rather more compact. All the long bones are similarly affected, so that the largest of them may be crushed between the fingers. Many are broken; but this, probably, was done after the death of the animal. *Hunterian.*

712. Sections of the humerus of a young Lion, which was affected with rickets. The humerus does not appear to be reduced in size, neither is there any disproportion between the thickness of its walls and the quantity of its medullary tissue; but its whole texture is greyish, light, dry, and friable. The strongest parts of the walls are formed of a very fine and close spongy texture, covered in by a thin layer of compact bone; but near the articular ends this outer layer is represented by a finely porous, woollen-cloth-like, or reticular surface. The cancellous tissue has its ordinary arrangement; but the fibres and lamellæ composing it are slender, thin, and weak. *Hunterian.*

713. Parts of the femur of the same Lion, similarly, and rather more, diseased. The shaft has been fractured at the junction of its upper and middle thirds; and no union has been effected, although some very light and spongy new bone has been formed about the ends of the fragments. The lower part of the shaft, also, has been bent; its posterior wall is transversely fractured, and its upper broken edge is driven into the cancellous tissue of the lower fragment. Both fractures appear to have occurred many days before death.

Hunterian.

They were marked "Rickety Lion."

714. A humerus, ulna, femur, tibia, and part of the scapula of the same rickety Lion. Their whole texture is light, dry, and friable; they have scarcely any compact tissue; and what there is, is very thin, porous, and brittle. The femur is broken in two places, and in no degree repaired. Part of the scapula also has been broken or bent and is fixed in its unnatural position. *Hunterian.*

715. The skull of a Monkey, of the genus *Macacus*. All the bones, especially those of the face and upper part of the cranium, are greatly increased in bulk, and are of a uniform, light, porous, friable texture. There is no distinction between the diploe and the tables of the cranial bones. The petrous portions of the temporal bones are least affected by the disease. The deciduous teeth were in process of being replaced by the permanent set.

Presented by Thomas H. Stewart, Esq.

Subdivision C. *Infantile Syphilis.*

716. The cranium of a child who was affected with congenital syphilis. The frontal suture is united and almost entirely obliterated, although the anterior fontanelle remains widely open; the coronal suture is also nearly effaced. On the outer table of the calvaria are several rounded elevations the surfaces of which have lost their natural smoothness and compactness, and have become remarkably porous. The most prominent elevations are on the parietal bones near the anterior fontanelle; that on the right parietal is much more porous than the elevation on the left side. The outer table is altered in the same manner along the whole length of the frontal suture; and there is another eminence on the left half of the frontal bone. There are several other, less elevated, patches where the outer table has become porous—some on the lower part of each parietal, and one along the border of the occipital bone close to the lambdoidal suture. The squamous parts of the temporal, the outer aspects of the wings of the sphenoid, and the surfaces of the malar bones and superior maxillæ, including the hard palate, are also slightly enlarged and porous. The inner table of the calvaria is quite normal; and the cranial bones are only slightly thickened. *Presented by M. Jules Parrot*, 1880.

717. The calvaria of a syphilitic child aged 14 months. The frontal and coronal sutures are nearly united; and changes in the outer table have taken place similar to those in the last specimen, but the affected portions are neither so porous nor so elevated. As in the last specimen also, these

changes are most marked in the neighbourhood of the anterior fontanelle and along the frontal suture, where the bone is much thickened. The under surface of the bone, examined by transmitted light, shows several small patches of atrophied osseous tissue ("craniotabes") in the posterior part of the parietal and in the occipital bones.

Presented by M. Jules Parrot, 1880.

718. The calvaria of a child, aged 12 months, who was the subject of congenital syphilis and rickets. The porous changes in the outer table are marked in the frontal and anterior parietal region; but there is no elevation of the affected portions. There is no atrophy of the bone ("craniotabes"). The long bones were much diseased (see No. 725 B).

Presented by Robert W. Parker, Esq., 1881.

719. The calvaria of a syphilitic infant, aged 8 months. The porous changes in the outer table, without much elevation of the bone, are very extensive; and the maroon colour of the affected parts is preserved.

Presented by Dr. Barlow, 1880.

720. The calvaria of a syphilitic child aged 7 weeks. Through atrophy of the bone several spaces, some over an eighth of an inch in diameter, are to be seen in the posterior part of the parietal bone. The changes in the bones of the extremities of the same subject are shown in Nos. 725 and 725 A.

The child was healthy at birth, but was attacked, after a few weeks, with symptoms of hereditary syphilis, viz. wasting, snuffling, fissures on the lips, and mucous tubercles about the anus. There was temporary improvement under mercurial treatment; but death occurred from marasmus. (See Trans. Path. Soc. vol. xxxi. p. 226.)

Presented by Robert W. Parker, Esq., 1881.

721. Sections of long bones of a syphilitic infant, with the scapula. They are very porous, the medullary canals are enlarged, and upon the surface of the bones a thick layer of porous osseous tissue is formed; this is best seen on the ulna, which has not been divided. *Presented by M. Jules Parrot*, 1880.

722. The long bones of the extremities, with half of the lower jaw, of a syphilitic child aged 3½ months. Most of the bones are abnormally porous; and those that have been longitudinally divided show "osteophytes" upon the layer of compact tissue. On the humerus this formation of new bone by the periosteum is very marked, especially anteriorly and posteriorly near the lower epiphysis. In most of the specimens there is much spongy bone between the osteophytes and the compact tissue.

Presented by M. Jules Parrot, 1880.

723. Sections of the long bones of a fœtus at birth, showing changes similar to those described in the preceding specimens.

Presented by M. Jules Parrot, 1880.

724. The halves of a femur, tibia, humerus, and radius of a syphilitic infant. The osteophytic deposits external to the compact tissue are well-marked on the posterior and inferior part of the shaft of the humerus, the upper and posterior part of the femur, and the front of the tibia, which is much curved. The medullary cavities are much enlarged at the expense of the wall of the bone. *Presented by M. Jules Parrot*, 1880.

725. Sections of a humerus, femur, and tibia from the same child as No. 725 A. The cut surfaces show a formation of new bone at certain parts of the shafts, especially towards the lower part of the humerus, where the shaft is encased in a layer of compact tissue separated from the normal external layer by cancellous tissue containing marrow. The osseous tissue adjoining the intermediary cartilages contains, in some of the bones, a yellowish material. (See Trans. Path. Soc. vol. xxxi. p. 226.)

725 A. Sections of the left humerus and tibia of a child, aged 7 weeks, who died with symptoms of congenital syphilis. As in the preceding specimen, a layer of newly-formed bone surrounds the shafts.

Presented, with the preceding specimen, by Robert W. Parker, Esq., 1881.

725 B. A section of an ulna and a humerus, divided longitudinally, from a syphilitic child, aged 12 months, who also showed symptoms of rickets. The lines of ossification are very ill-defined, especially at the upper extremity of the humerus, which has been spontaneously fractured at its centre. The broken ends are placed at a right angle and united only by thickened periosteum lying within the angle.

Presented by Robert W. Parker, Esq., 1881.

Subdivision D. *Cretinism.*

726, 727. The bones of the upper and lower extremities of a fœtus born at the full term, with changes produced by a disease which, in some respects, resembles rickets. All the long bones are stunted and deformed, except the clavicle, which is normal and longer than the humerus. The scapula shows much thickening of bone where the epiphysial cartilages join it. The epiphyses of the long bones are all enlarged; no irregularity in the line of ossification is observed, as in rickets; but there is an ingrowth of the periosteum between the epiphysis and the shaft, which is well shown in the epiphyses of the humerus and of the lower end of the femur, where ossification had not commenced. The shafts of the long bones are abnormally short, but thicker than in a healthy subject. They are hard and compact on their outer surface, and their natural curves are much exaggerated, especially in the radius and femur. The epiphysial cartilages are flattened out. Examined under the microscope, the cartilage in the greater part of each epiphysis was not altered, but along the line of ossification the cells were much enlarged, and their normal arrangement in vertical rows was imperfect. *Presented by Dr. G. E. Herman*, 1880.

728. The macerated bones of the extremities from a fœtus similarly affected. The shafts of the long bones, excepting the clavicle, are short and greatly thickened, but not so curved as in the last two specimens. They are enormously widened at their extremities, the lower end of the femur being more than three times the diameter of the middle of

the shaft. The interior of the humerus is exposed by section; its compact layer is normal, or rather thickened, the cancellous tissue well formed, and the medullary canal distinct.

729. The skeleton of the trunk of the same fœtus, showing enlargement of the ribs at the point where they join the costal cartilages, and also at the costo-vertebral articulations. The vertebræ are normal, but the spinal column has become bent during the preparation of the specimen.

730. The base of the skull of the same fœtus. The basi-occipital and basi-sphenoid bones are completely ankylosed, the foramen magnum is small and triangular, and the processus gracilis of each malleus is completely ossified.

A full account of the skeleton will be found in the Trans. Path. Soc. vol. xxxii. p. 369; the ossification of the processus gracilis of the malleus forms the subject of a paper in the 'Journal of Anatomy and Physiology,' vol. xiv. p. 201.

Presented by S. G. Shattock, Esq., 1880.

731. A femur from the fœtus No. 319, Teratological Series. It exhibits a disease similar to that which has affected the five preceding specimens. The shaft is short, thick, and strongly curved, the epiphyses are large, and are separated partly from the shaft by an ingrowth of periosteum.

Presented by William Lyon, Esq., 1825.

732. A skeleton of a fœtus, complete excepting the right upper extremity. The cranium is enlarged from hydrocephalus, the basi-sphenoid is completely ankylosed to the basi-occipital bone, and the shafts of the long bones are short and curved; the ribs also are enlarged at their extremities, as in the specimens Nos. 726–730.

Presented by Walter Cooper Dendy, Esq., 1868.

732 A. A cretinous fœtus, with shortening and deformity of the limbs, the result of fœtal rickets. The head and trunk of the infant are apparently well formed.

Presented by Dr. A. Wiltshire, 1882.

Subdivision E. *Mollities Ossium : Osteomalacia.*

733. A small section of a frontal bone, half an inch in thickness, and presenting, with scarcely any trace of the natural distinction of tables and diploe, the same uniform, porous, very finely and closely cancellous texture as Nos. 686 and 687.

From a young woman, aged 29. When 19 years old her health was permanently impaired by an attack of scarlet fever. Two or three years later she broke one clavicle, which never united. Her spine next began to yield, and she was attacked by acute rheumatism, followed by insanity. Her limbs became curved, fractures took place from the slightest injuries, and she suffered from excruciating pains in the bones. Her eyes appeared prominent from thickening of the walls of the orbits. After death all the bones of the skeleton were found to be very soft. The bones of the extremities could be fractured with very slight force; their osseous structure was reduced to a mere shell, filled with a dark grumous matter (see No. 744). The bones of the vertebral column and ribs were thickened, soft, and vascular. See "Remarks on the Pathology of Mollities Ossium," Medico-Chirurgical Transactions, vol. xxvii. p. 437.

Presented by Samuel Solly, Esq.

734. "A specimen of mollities ossium injected," consisting of the half of a humerus divided longitudinally.

Hunterian MS. Catalogue.

From a woman aged 34. After suffering from severe rheumatic pains in the limbs, she broke her leg from tripping against a brick. She soon afterwards became pregnant, and broke her left femur getting out of bed; she was safely delivered, but suffered several more fractures. Again becoming pregnant, she gave birth to a healthy child, and her own health improved; but during the next pregnancy the fractured bones (which had united) broke again, the dissolution of their callus being preceded by excruciating pain. Several new fractures then occurred, and on her death, after three years' illness, the bones were found to be so soft that they could be easily cut through with a penknife. The cranium and vertebræ were much affected; the bones of the lower extremity were the least diseased. For a complete history of the case, with observations by Mr. Hunter, see "A Case of Fragility of the Bones," by Mr. W. Goodwin, 'London Medical Journal,' vols. vi. & viii.

735. A part of the other section of the same humerus, dried and shrivelled into a tough flexible mass like a piece of dried muscle.

Hunterian.

736. Another portion of the same humerus, together with the radius, ulna, carpus, and bones of the hand of the same patient. The portions of the humerus and the shafts of the radius and ulna have, in drying, shrivelled into a light substance of a dark reddish colour, almost like dried muscle; their extremities are less altered but very light. The radius and ulna have both been fractured in their shafts, and no attempt at union appears to have been made. The bones of the hand are light but not evidently softened. *Hunterian.*

737. A left femur, which was fractured near the junction of its middle and lower thirds while the patient was being turned in bed. The portions are imperfectly united by light and friable new bone deposited about the seat of fracture. The surface of the shaft is rough, through the irregular removal of small portions of its outer compact laminæ: it is more than naturally curved forward and inward; and the neck forms hardly more than a right angle with its axis. The whole texture of the bone is very light and greasy; and, in drying, the greater part of it has acquired a dark mahogany-colour: the walls, at every part except near the trochanters and linea aspera and on the neck and head, may be broken and crushed by the pressure of the hands. *Hunterian.*

The specimen was marked "From an Archbishop of Canterbury."

738. The upper part of the right femur of the same patient. It was similarly diseased and was fractured by a very slight force. *Hunterian.*

739. Longitudinal sections (made with a knife) of a left femur affected with mollities ossium. The whole of the osseous substance has been removed from the shaft. In the place of the walls of this part there is nothing but the periosteum, increased to nearly a line in thickness and of a deep pink and brownish-crimson colour. The space which it encloses is about as large as the shaft of an ordinary female femur, and is filled with a soft, reddish, probably fatty substance,

varying in consistence at different parts. When recent (and these characters are still nearly preserved), "one mass presented the appearance of almost pure coagulated blood, another resembled a very gorged state of the liver, though scarcely more firm than dark blood; at one point it was of a comparatively light fibrinous character; at another the appearance was more that of a compact fleshy substance."

In many situations, also, in this substance, there are small oval cavities containing oily fluid; and a large quantity of oil has oozed from it. At the condyles, the trochanters, and the head and neck of the femur some of the cancellous tissue and a thin layer of the wall of the bone remain; but they are very soft and are infiltrated with a substance similar to that by which the whole of the shaft is replaced.

About five inches below the trochanter major the shaft has been broken; but it has re-united by a thin layer of a firm pink substance, and the periosteum is contracted around the fractured part, so that it is reduced to half the size of the rest of the shaft. About three inches below this a second fracture occurred and the parts did not again unite. The articular cartilages are healthy and of their natural thickness.

From the Museum of John Howship, Esq.

740. Other and similar sections of the same femur.

From the same Museum.

741. A vertical section of the right femur of the same patient, exhibiting similar changes; but the colour has been destroyed by immersion in water. A fracture occurred in the part of the shaft exactly corresponding to that at which the left femur was fractured, and was united with a similar contraction of the periosteum.

From the Museum of Robert Liston, Esq.

742. The remains of a vertical section of the head, neck, and upper part of the shaft of the right femur of the same patient, after maceration and boiling. There is scarcely

sufficient of the osseous tissue left to indicate the original form of the bone: of the shaft and neck nothing remains except a few small osseous lamellæ, held together by fine fibres; but in the place of the trochanter major and the head, there are small masses of cancellous tissue filled with adipocere. A portion of the trochanter major is suspended separately. At the bottom of the bottle is a large quantity of white crystalline fatty matter, which was obtained by boiling this portion of the femur after the whole of its soft contents had been converted, during maceration, into adipocere.

From a lady 35 years of age, who had been the subject of mollities ossium for five years and a half. The disease commenced, it is believed, after a chill, which produced amenorrhœa for several months, during which period she began to walk "rather stooping and in a rolling manner." In two years' time, after temporary improvement varied by occasional relapses, severe pain commenced in the right hip: the spine then became curved. Two years later the right thigh was fractured when the patient was being lifted into bed: a month later the left femur was broken by cramp of its own muscles. Severe pains in the wrists and thighs followed; on passing the fingers along the integuments of the thighs, large drops of fetid perspiration immediately appeared along the lines of pressure. She died worn out by pain, diarrhœa, &c., but before death the fractures of the thigh-bones had united. (See "A Case of Mollities Ossium, with the appearances on dissection," by John Howship, Esq., Trans. Medico-Chir. Soc. of Edinburgh, vol. ii. p. 136: Edinburgh, 1826.)

From the Museum of John Howship, Esq.

743. Section of a femur, fractured by a slight force through the junction of its upper and middle thirds. It has been macerated and dried. Its walls are thin soft, and flexible, and their lamellæ are partially separated. Every part of the interior of the bone is filled with fatty matter. In the recent state, the place of the medullary and cancellous tissue was occupied by soft, jelly-like, transparent fat, coloured in various shades of yellow and pink, with blotches of deep crimson; and a similar kind of fat appeared to be infiltrated in the walls of the bone. Both in the recent state and after maceration it closely resembled the specimen last described.

The patient was a woman, 69 years old at the time of her death.

For many years before death she had suffered obscure signs of disease, referred at different times to several organs, and variously treated without any benefit. She was unable to stand without support and was confined to her house and, generally, to her bed. She was made much weaker by a course of mercurial medicine to which she was subjected; but shortly afterwards, under the use of tonics, she became stronger and was able again to walk, though feebly. This improvement occurred about three years before death. Two years later she was affected with pains in nearly all her limbs, which were considered rheumatic. She grew weaker, was soon again confined to her bed and, three days before her death, her thigh was fractured in an effort to move her. After this she sank rapidly.

Many of the long bones, examined after death, were in the same state of disease as that described above. With the microscope, the constituents of the yellow, pink, and crimson substance occupying the place of medulla were found to be—free oil in large quantity, globular and disk-shaped masses of crystals of margarin free or enclosed in fat-cells, a few fat-cells like those of healthy medulla, and numerous empty and collapsed fat-cells with nuclei. The pink and crimson colours appeared to be due entirely to a portion of the oil-globules and of the nuclei and granules in the collapsed fat-cells being so coloured. The bone-corpuscles were healthy, but not numerous.

Presented by R. W. Tamplin, Esq.

744. Section of the lower third of a femur, presenting appearances very similar to those observed in the recent bones of the patient whose case is last described. The femur is of natural size, but its walls are not anywhere more than half a line in thickness; they are soft, compressible, easily cut, and in some places at the back of the femur their whole thickness is absorbed, and large apertures are formed where the cancellous tissue is covered by the periosteum alone. Of the cancellous tissue, the osseous part remains within and just above the condyles; but elsewhere it is removed. The lamellæ and fibres which it forms within the condyles are slender and wide apart, the spaces between them being full of bright-yellow, soft, fatty matter. Above this part the medullary tube contains no osseous substance, but is filled with soft, yellow, pink, brownish and blood-coloured fatty matter, which has in parts a transparent gelatinous appearance. This fatty matter, in the recent state, exhibited various hues, from a deep Modena red to a bright crimson; and the irregular empty spaces which it

presents were, in the recent state, filled with fluid like serum. The upper part of the specimen is broken, a fracture having here occurred, in consequence of very slight force, twelve months before death. In the recent state, "the extremity of the bone, to the extent of about one third of an inch [above the articular cartilage], was of a bright red colour."

From a woman aged 39. The disease commenced four years before death with pains in the back and limbs resembling rheumatism. Eleven months after the onset of these symptoms, both her thigh-bones were broken as she was being lifted into her bed. Distortion soon became perceptible in the face and thorax, as well as in the extremities. The patient died suddenly during an attack of painful dyspnœa. The disease was found to involve the entire skeleton; the skull was soft and very vascular, but not thickened. One of the kidneys contained in its pelvis a large calculus of phosphate of lime, and the urine shortly before death contained a large excess of that salt. The case is fully reported in Mr. Solly's paper referred to in the description of No. 733.

Presented by Samuel Solly, Esq.

745. Portions of the sternal ends of three ribs affected with mollities ossium. *Presented by S. Solly, Esq.*, 1868.

746. A clavicle, the middle of which, having become soft, yielded to the weight of the arm and to the contraction of the muscles above it. The shaft is bent to an angle of about 120°, the apex of which is directed upwards. At the angle the shaft is slightly enlarged by the formation of a ring of new bone around it.

From the Museum of John Howship, Esq.

Among the specimens of Atrophy of Bone in the Museum are Nos. 21 to 23, 26 to 32, 36 to 39, 43, 3792, and many other specimens in the Series of Diseases of the Joints and the Spine.

Subseries 3. Fractures and similar Injuries of Bones.

Process of Repair: 747 to 824.
Deviations from the ordinary process: 784 to 811, 679, 681, 975, 1117, 1118-9, 1122-3.
Failure of Repair: 812 to 824, 679, 713-4, 736, 741, 743-4, 937, 952-3, 969 to 976, 981; and other Fractures of the Neck of the Thigh-bone, of the Olecranon, and the Patella.
Gunshot and other Injuries: 825 to 846. (See also the Indices, pp. 100 and 101.)
Fractures and Wounds of the several Bones of the Skeleton: 847 to 1114.
Varieties of Fractures, see the Index, p. 101.

Subdivision A. *The Ordinary Process of Repair of Fractures.*

Reparative material, recent and soft: 747 to 752.
„ „ firm and looking fibrous: 753 to 757, 981 to 987.
„ „ cartilaginous: 760 to 762, 764.
„ „ ossified: 763 to 779.
Structure of Callus: 780 to 783.
Changes of Periosteum: 754, 757.
Repair with intermediate Callus: 747 to 759.
„ „ ensheathing (or provisional) Callus: 760 to 770.
Repair completed: 772 to 779.

[Many other illustrations of all the parts of the process are in the following specimens of the Series. Among the specimens of Fractures of the several bones (847 to 1114) the same arrangement is generally observed as in these following illustrations of the usual process of repair.]

747. "A fracture of the os humeri, bristles put into the coagulated blood."—*Hunterian MS. Catalogue.*

It is probably to this preparation that the following passage in Duncan's 'Medical Commentaries' (Lond., 1775), vol. i. 8vo, p. 322, refers. It is appended to a letter from Mr. Cruickshank to Dr. Duncan, in which he relates Mr. Hunter's opinions respecting puerperal fever:—

"We formerly gave a short view of his (Mr. Hunter's) opinion respecting the blood being possessed of a living principle. We are now informed that he is every day more satisfied of its being well founded. Among other particulars the following circumstance has served to confirm him in it:—A man was brought to St. George's Hospital with a simple fracture of the os humeri, and died about a month after the accident. As the bones had not united, Mr. Hunter injected the arm after death. He found that

the cavity between the extremities of the bones was filled up with blood that had coagulated. The blood was become vascular; in some places it was very much so."

748. The other portion of the same humerus.

749. Part of a femur, fractured obliquely at the junction of the middle and lower thirds. The upper portion projects downwards behind the lower. The ends of the bones are enclosed in an irregular cavity bounded by the muscles and cellular tissue of the thigh and thickly lined with lymph. The cancellous tissue at the fractured extremities also appears filled with lymph or coagulated blood. A quill is passed through a canal leading from the popliteal space to the cavity around the ends of the bone. *Hunterian.*

750. Section of a fractured tibia. The portions of the bone are rather widely separated, and the space between them is filled with a soft vascular substance. The blood-vessels have been injected. The muscles and other tissues adjacent to the fracture appear indurated and confused.
Hunterian.

751. A vertical section of the lower end of a tibia. A compound fracture extended, by a vertical fissure, into the ankle-joint. In the plane of the fracture through the bone there is a thin layer of pale soft tissue, in which bristles are set: over the fracture through the articular cartilage is a thin membranous layer of lymph. *Hunterian.*

752. The other section of the same tibia, showing similar changes, with a somewhat wider separation of the fragments.
Hunterian.

753. The lower ends of a tibia and fibula. A fracture extended through the tibia into the ankle-joint. The cracks through the articular cartilage of the tibia are filled with a firm substance like lymph; and parts both of this cartilage and of that covering the inner surface of the external malleolus have been removed by ulceration. The bone thus exposed

is smooth and hard; the adjacent edges of the cartilage shelve towards the bone. *Hunterian.*

754. A vertical section of the lower part of a femur, which was fractured just above the condyles forty-two days before the patient's death from apoplexy. The periosteum, a part of which has been reflected, is nearly a quarter of an inch thick, and forms the chief bond of connexion between the fractured portions. Lymph is effused within and upon their extremities.

755. Another section of the same femur. The fractured surfaces of cancellous tissue are connected by a thick layer of compact fibrous-looking substance, and the part adjacent to the fracture is filled with lymph.

756. Another section of the same femur exhibiting similar appearances. Here, also, a portion of the cancellous tissue, which had been completely separated, is united to the others by fibrous substance.

757. Another section of the same femur, including part of the wall of the bone. The bonds of union are a tough fibrous-looking tissue, a layer of which intervenes between the adjacent surfaces of the walls and the thickened periosteum which passes from one portion to the other.

In the interval between the accident and the attack of apoplexy the general health of the patient, a man 66 years old, had not been affected.

Presented, with the three preceding, by Joseph Swan, Esq.

758. Portion of bone removed, with a trephine, from a boy's skull. It is traversed by a fracture, the edges of which are united by a soft substance. *Hunterian.*

759. Section of the humerus of an Ostrich, fractured transversely through its shaft. The interior of the bone, for nearly an inch above and below the fracture, is filled with a soft

substance, apparently organized lymph; its exterior is unaltered. *Hunterian.*

760, 761, 762. Sections of three tibiæ from Rabbits, showing the process of repair by 'provisional callus,' at the periods of six, ten, and fourteen days after the injury. The portions of bone are, in all the cases, widely displaced and overlapping. In all, their ends are ensheathed in a firm vascular substance, which, in the fracture of the longest date (No. 762), has assumed the appearance of compact cartilage. In the first two specimens, the periosteum is continued over and adherent to the surface of this substance, the seat of which is thus shown to be between the periosteum and the bone. *From the Museum of Sir A. P. Cooper.*

763. Part of a fractured rib, labelled in the handwriting of Mr. Hunter, "The extravas. blood has died and absorb'd. The adhesive inflam. in the surrounding parts is forming the union." The broken ends of the rib are in apposition, and an irregular ring of new bone is formed round each of them; but the two rings have not coalesced so as to form a bond of union like a "provisional callus" encircling the fractured part, neither has any union taken place between the bones themselves. *Hunterian.*

It deserves notice that here, as in other cases, Mr. Hunter pointedly distinguishes the union of parts by adhesion in consequence of inflammation from that which, more naturally, takes place (as he believed, by the organization of the effused blood) without inflammation.

764. Section of the ulna of a Fowl fractured obliquely through the distal part of its shaft. The broken extremities are rather widely separated, but are held together by a firmly attached ring of cartilaginous and osseous substance, irregular in its form and from half an inch to an inch in width. The interior of the bone near the seat of fracture is filled with a firm substance, but its walls appear to have undergone no change. *Hunterian.*

765. A longitudinal section of a transversely fractured rib, from a Pig. The fractured portions are held close by "provi-

sional callus," a large nodulated mass of new bone being formed like a ring encircling their adjacent extremities and holding them together. There is no union of either their walls or their cancellous texture; and the line of fracture by which these are still separated is prolonged through a great part of the thickness of the surrounding new bone, as if ossification had taken place last in the part of the callus immediately surrounding the plane of fracture, and therefore least fixed in its position. In this plane it is also probable that the chief injury to the periosteum took place.

From the Museum of Sir A. P. Cooper.

766. Part of a rib (from a small mammal) fractured and reunited, with a great accumulation of bone around the injured part. The surface of the new bone, or provisional callus, is marked by an irregular circular groove, indicating, as in the preceding specimen, that the ossification of the callus is incomplete round the plane of fracture.

Hunterian.

767. Section of a long bone fractured transversely. The fractured ends of the bone are held in exact apposition by an encircling ring of osseous substance half an inch wide and firmly united to them. The cancellous tissue near the seat of the fracture is filled with a compact bone-like substance; but the line of fracture across the wall of the bone is still distinct and partially open. *Hunterian.*

768. The radius and ulna of a bird. The ulna was obliquely fractured through the middle of its shaft. A section through the seat of the fracture shows the two portions in exact contact and ensheathed in very compact osseous substance, which extends for more than half an inch above and below the fracture. The medullary canal is in both portions filled with a similar substance; but the line of fracture is still discernible across the shaft.

From the Museum of George Langstaff, Esq.

769. Section of a fractured humerus, of which the blood-vessels have been minutely injected, and which has been dried after the removal of its earthy matter by some acid. For more than an inch above and below the seat of fracture, the interior of the shaft is filled by a compact and vascular substance; and on a part of its exterior is a thin layer of porous and vascular osseous tissue, which has completely coalesced with its wall. The line of fracture is not discernible. *Hunterian.*

770. An oblique section of one of the portions of a fractured bone, similarly prepared. The wall of the bone appears surrounded by a thick layer of porous and vascular osseous substance. *Hunterian.*

771. Section of a fractured tibia, similarly prepared. The continuity and form of the wall of the bone are completely restored, but the substance in the cancellous tissue appears more compact at the seat of fracture than elsewhere.

Hunterian.

772. A right clavicle fractured through the middle of its shaft, and so completely repaired that there is but a trace of the injury. *Hunterian.*

773. A longitudinal section of the upper two thirds of the shaft of the right femur, from an infant, seven months of age, whose thigh was fractured at birth. The fracture, which is situated a little below the lesser trochanter, has united with much angular deformity. The lower fragment shows a line of compact bone running up the centre of the section, which indicates the remains of the wall of the bone as it existed at the time of injury. This fragment having been stripped of its periosteum, has ceased to grow, but a considerable amount of bone has grown up around it extending to the angle of fracture. The new bone appears to be of normal thickness and strength.

At the child's birth there was a cross-presentation, and on

hooking down the right leg the medical attendant heard a snap and found that the femur was broken. The fracture was put-up in splints, but much deformity remained. The child wasted gradually, and died when seven months old.

Presented by Richard Rendle, Esq., 1873.

774. Sections of a tibia in which a fracture of the lower part of the shaft has been completely repaired, the wall being continuous and of equal thickness throughout, and the cancellous tissue presenting its natural characters at the seat of fracture.

From the Museum of Sir A. P. Cooper.

775. Section of a humerus in which a fracture of the lower part of the shaft has been completely repaired. The portions are in almost exactly their true position ; the repaired wall on one side is a little thickened ; the cancellous tissue has its natural appearance.

From the Museum of Sir A. P. Cooper.

776. A humerus which was fractured at the junction of the middle and lower thirds of its shaft. The portions were rather widely displaced ; but the adjacent parts of their extremities are firmly and smoothly united by new bone formed between them. The overlapping ends are reduced in size ; and at the end of each fragment the medullary tube is covered by a layer of compact bone, in which appear large apertures for the transmission of nutrient vessels.

Presented by Sir William Blizard.

777. A radius fractured obliquely through the middle of its shaft and firmly united, with some displacement. The section shows complete restoration of the wall and of the cancellous tissue.

Presented by Gilbert W. Mackmurdo, Esq., 1867.

778. Part of a parietal bone in which a fracture, with depression of a circular portion about three fourths of an inch in dia-

meter, has been completely healed. The depression is to an extent of nearly one fourth of an inch below the level of the inner table. The lines of the fracture, which appears to have been starred from the centre of the depressed portion, are scarcely discernible.

From the Museum of George Langstaff, Esq.

779. A skull with numerous deep indentations on its upper and hinder parts. The edges of these, which appear to be old sabre-cuts, are rounded, and some of the projecting pieces of bone have the appearance of having been completely detached and reunited.

From the Collection of Joseph Hodgson, Esq., 1869.

Structure of Callus.

780. A section of "cartilaginous callus," of which the vessels have been minutely injected. The greater number of the vessels displayed belong to the muscles and other tissues consolidated round the seat of fracture. *Hunterian.*

781. Section of callus from the neighbourhood of a fracture, injected and dried. Two small isolated portions of bone are formed in it. *Hunterian.*

782. A similar preparation, in which the callus is more extensively ossified. *Hunterian.*

783. Section of callus, with a portion of periosteum, from the neighbourhood of a fracture. Bone is formed in the lower part of the callus. *Hunterian.*

Subdivision B. *Deviations from the ordinary Repair of Fractures, due to Displacement or other such conditions of the Fragments.*

With wide separation of the Fragments: 784 to 791, 794, 803, 892 to 896, 906–7, 923, 933–4, 1010, 1011, 1025.

With detachment of Fragments: 756, 792 to 802, 812, 815, 816, 866, 867, 868, 910, 929.

With very angular union: 791, 795, 811.

With Necrosis and other complications: 804 to 810, 818, 871, 924, 944, 945, 1045, 1048, 1069, 1096, 1097, 1098, 1102.

Failure of Repair; Union by fibrous tissue; Formation of false joints and bursæ: 941 to 945, 953, 812 to 824, 969 to 976, 981, 1055 to 1068.

784. Section of the tibia of a middle-aged woman, which was fractured through the junction of its middle and lower thirds sixteen weeks before death. The ends of the two portions overlap each other nearly an inch, and are firmly united by new bone formed between those surfaces which, in their overlapping, were opposed to and nearly in contact with each other. No new bone or callus is formed at any other part. The periosteum and other tissues near the bones appeared healthy, except in having small effusions of blood in them. *Presented by Sir William Lawrence.*

785. A transverse section of a fractured femur in which the portions are united, one lying upon the other. The adjacent and opposed surfaces of the two portions are united by an intermediate mass, or bridge, of coarse cancellous bone. *Hunterian.*

786. The humerus of a Vulture fractured just below the middle of its shaft. The extremities of the portions were displaced nearly an inch from each other, but have been united by a strong smooth bridge of bone. *Hunterian.*

787. Two transverse sections of the shaft of a femur which was fractured and whose portions united, overlapping each other. The sections, like the preceding, show that, in these cases, each portion of the shaft retains its usual characters, and

that the union is effected by bone formed between their adjacent surfaces and coalescing with both of them. In the new bone, also, there is formed, in this instance, an outer compact wall continuous with the sides of the walls of the shaft, and an internal cancellous tissue exactly similar to that of the shaft, with which, in the lower section, it has coalesced. *Presented by Sir William Blizard.*

788. Transverse sections of the left femur of a Fowl which was fractured near the middle of its shaft. The lower portion was drawn backwards and more than half an inch upwards, and was turned half round; but it has been firmly re-united by an intermediate mass of bone, composed like the bonds of union in the preceding case. The ends of the medullary tube exposed by the fracture are closed by smooth hard layers of bone. *Hunterian.*

789. Longitudinal sections of the humerus of a Turkey which was fractured just below the middle of its shaft. The extremities of its portions were much displaced, but have been united by a strong bridge of bone, formed of cancellous tissue continuous with that of the two portions of the shaft, and invested by a thin layer of compact tissue continuous with their walls. *Hunterian.*

790. Section of the lower end of a fractured tibia, injected, softened in acid, and dried. There was considerable lateral displacement of the portions of bone, and only the halves of their fractured surfaces have united. To this extent, however, the union is complete, and the line of fracture across the cancellous tissue is scarcely discernible.

From a case of compound fracture. "The sore" [consequent on the protrusion of the bone] "never would heal; nor could the man ever bear any weight upon it: probably from its having united by so small a surface; the limb was therefore amputated." —*Hunterian MS. Catalogue.*

791. Part of a femur which was fractured transversely through the middle of the shaft. The portions were much displaced, the lower being drawn behind the upper, and they now

form an angle of about 150°. The extremity of the lower portion is fixed to the posterior surface of the upper one a full inch from its lower end, which has undergone no further change than a slight rounding of its fractured edges. The bonds of union consist of two broad bridges of bone extending from the end of one to the sides of the other portion.

Presented by Sir William Blizard.

792. A section of the shaft of a femur showing an oblique and comminuted fracture. The upper end of the lower fragment is covered by a layer of callus, which also serves to unite it to the upper fragment. A large splinter, including about three inches of the linea aspera, which was separated from the back of the femur and displaced downwards, adheres to both portions, partly by ligament, partly by bone. The lower end of the upper fragment is smooth and rounded.

From a man aged 76, of temperate habits. The wheel of a waggon passed over his thigh, producing a simple comminuted fracture of the femur at the junction of the middle and upper thirds, and the sharp upper fragment projected under the skin. The limb was put-up with a long outside splint and sandbags, changed after a few days for a long back-splint with a footpiece. About sixteen days after the fracture suppuration occurred in the tissues around the seat of injury. He partially recovered in a month, but died, three months after the fracture, with pyæmic pneumonia. (See MS. Notes, vol. i. p. 152.)

Presented by Edward Cock, Esq., 1868.

793. The other half of the same femur, macerated and dried. The open medullary cavity at both of the fractured ends is not completely filled in with new bone, but the surrounding edges of compact tissue are rounded off and thickened. The two fragments are united by a band of new porous bone passing between their outer surfaces.

Presented by Edward Cock, Esq., 1868.

794. A femur in which there has been a compound fracture at the upper part of its shaft. The upper portion was placed nearly an inch in front of the lower one, and overlapped it

nearly two inches; but they are united by two lateral bridges of light spongy bone. The medullary tube is not closed at either of the fractured ends. The whole bone is very light. *Hunterian.*

795. The femur of a Fowl which was fractured in two places below the middle of its shaft. The portions have united firmly with a great accumulation of bone; but the lowest portion has fallen and been turned downwards and backwards so as to form an acute angle with the upper portion. *Hunterian.*

796. Part of a fractured tibia. The portions are united by a soft substance; and a fragment, detached and pushed behind the others, is firmly fixed in the soft tissues around the bone. *Hunterian.*

797. A section of a tibia which was fractured about four inches above the ankle, three months before the patient's death. The union is very imperfect. New bone, of light texture, has been formed around the extremities of both portions; but none has been produced between them, and they are held together only by part of the periosteum and by a soft substance formed in the line of fracture. A portion of the wall, completely separated and pushed outwards, is united by a soft tissue to the adjacent part of the shaft.

The patient was 48 years old. A wheel passing over his leg produced a comminuted fracture of both the bones. Common splints not serving to prevent the retraction of the lower fragments, Desault's splint was applied; and with this the limb remained quiet and the apposition of the fragments appeared complete. Ten weeks after the injury the patient was attacked with fever; and this was followed by erysipelas of the face and head, with which he died.

From the Museum of John Howship, Esq.

798. A section of the femur of a Cock in which, after it was broken into three pieces, the upper portion was widely displaced. The two lower portions have firmly united by bone, and the space between them and the upper portion is filled by

a tough fibrous-looking tissue, by which they are securely held together, and in which there is a small isolated portion of newly formed bone. *Hunterian.*

799. The other section of the same femur. *Hunterian.*

800. A vertical section of a radius in which there was a compound fracture. The two portions are wide apart, but are united by a large quantity of tough ligamentous substance. In the middle of this substance is part of a cavity in which was a small detached portion of bone. *Hunterian.*

801. The other section of the same radius, together with the detached piece of bone between the ends of the fractured portions. *Hunterian.*

802. A left femur, fractured almost vertically through the middle of the great trochanter, and very obliquely just below the middle of its shaft. In the situation of the former fracture, the parts have firmly re-united; but the part of the trochanter major which remained with the head and neck was drawn upwards and a little backwards, so that the axis of the neck was horizontal, and a broad cleft was left between the two portions of the trochanter, which cleft is nearly filled by new bone. In the lower fracture, also, the parts are firmly re-united, though with much shortening and distortion. A splinter, five inches long and nearly an inch wide, was at this part broken from the outside of the femur, and this "splinter having by some extraordinary circumstance been turned round on its bone, so that it must have been quite detached, its periosteal surface is laid on that of the bone, and the internal or reticular surface presented to the muscles; but what is extraordinary is, the strong bony attachment by which it is fastened to the original bone, when, from the change it had suffered in its situation, it must have been entirely detached" *.

Hunterian.

* "Hunterian Reminiscences, being the Substance of a Course of Lectures delivered by Mr. John Hunter, in the year 1785." Edited by J. W. K. Parkinson. London, 4to, 1833, p. 111.

803. The upper part of a right femur, fractured vertically through the base of the neck and the great trochanter. The shaft is drawn up, so that the great trochanter is above the head; but the fractured surfaces have united firmly, and an exceedingly large quantity of new bone is accumulated upon and around the trochanters. The neck of the femur is not shortened or altered in form. *Hunterian.*

804. A forearm and hand in which a compound fracture of the radius and ulna occurred five months before amputation. Both bones are protruded through the skin, and surrounded by granulations and sloughs. The ulna projects about three inches. Nearly one inch of its protruded extremity has perished, and a line of separation is formed between the dead portion and the upper part which, though projecting so far beyond the skin, appears to have retained its vitality.

The patient was a Lascar. A top-mast fell on his arm while at sea, and produced this compound fracture, which was at once tightly bound up (there being no surgeon on board the vessel), and so remained till, five months afterwards, he arrived in London. Amputation was immediately performed, but he died exhausted.

Presented by Sir William Blizard.

805. A tibia and fibula which were fractured between three and four inches above the malleoli. The upper portions are thrust downwards, so that their extremities are nearly at the level of the ankle-joint, and the articular surfaces of the lower portions are turned obliquely outwards. The several portions are, however, united by strong bridges of bone passing between their nearest surfaces. A piece of the anterior wall of the tibia, nearly five inches in length, has necrosed and is separated. The adjacent part of the shaft is covered by irregular pointed processes and plates of new bone. *Presented by Sir William Blizard.*

806. A segment of the shaft of a humerus, broken from the remainder of the bone and itself comminuted. It had become necrosed owing to separation of its periosteum, and separated fifteen days after the fracture. An attempt at

repair has taken place, a thin layer of new bone being formed on the surface, and covering a vertical line of fracture.

From a boy aged 16. A cab-wheel passed over his arm, inflicting a severe compound fracture. After the removal of this fragment the patient recovered, with a useful though shortened arm.

Presented by John Gay, Esq., 1877.

807. The lower portions of a right tibia and fibula, with the astragalus. A compound fracture has taken place about two inches above the malleoli, and the divergence of the tibia and fibula indicates that the astragalus was driven up between them. The bones have united, but in a very distorted position. A large portion of the cancellous tissue of the tibia has suffered necrosis, and is seen in the preparation partially imbedded in the new bone, which has been thrown out around the fractured surfaces in broad bridges uniting the tibia and fibula both in front of and behind the joint.

This specimen is figured in Sir Astley Cooper's 'Treatise on Dislocations and Fractures of the Joints,' edit. 1842, p. 307.

Presented by Sir Stephen L. Hammick.

808. The half of a right foot and ankle-joint, dissected to show an oblique fracture of the internal malleolus, which has again united to the tibia with the formation of a considerable amount of callus. The tendons of the tibialis posticus and flexor longus digitorum have not been disturbed from their relations. The cartilages on the articular surfaces of the tibia and astragalus have been destroyed through disease following the fracture.

From a man aged 57. Inflammation of the ankle-joint took place, for which the foot was amputated four months after the injury.

Presented by John Hilton, Esq., 1864.

809. The femur of a young person in which a transverse compound fracture occurred near the junction of its middle and lower thirds. The upper portion of the bone lies in front of the lower one and extends over it more than three

inches. Nearly the whole length of the portion thus displaced has perished and is surrounded by a broad and deep groove. The greater part of the rest of the shaft is thickly covered with new bone, from which a broad process extends more than an inch backwards, and unites the posterior part of the upper portion with the top of the lower one. On this lower portion, also, some small pieces have perished and were being exfoliated. *Hunterian.*

810. A femur, tibia, and fibula fractured and united with great distortion. The femur was fractured transversely across the middle of its shaft and its two portions are widely displaced, the lower being drawn upwards, behind and to the outer side of the upper one. They are held together by a strong bridge of new bone extending across the angle which they form. The fractured ends themselves are not united; they are rendered irregular by deposits of new bone and by the exfoliation of large portions of their walls.

The tibia was fractured at the junction of the upper and middle thirds of its shaft. Its portions are united with slight lateral displacement, and a long piece of its posterior wall has exfoliated and lies between the fibula and the remainder of the shaft of the tibia.

The fibula was fractured about three inches below its upper end. Its portions are not united, but a considerable quantity of new bone is formed upon their surfaces near the seat of fracture. Nearly two inches of the lower part of the fibula were completely removed. The external malleolus, however, remains.

The patient, a boy 14 years old, was entangled by machinery, and several other bones besides these were fractured. He died three months afterwards.

From the Museum of Robert Liston, Esq.

811. A leg and foot, in which the tibia and fibula appear to have been fractured in the lower third and to have united in a very remarkable position. The lower fragments are turned backwards and upwards at an acute angle with the others, so that the heel is brought into proximity with the middle

of the calf of the leg. The inferior end of the upper fragment of the tibia forms a strongly marked projection in front of the dorsum of the foot; it is somewhat enlarged and smoothly rounded, and was covered by a dense skin like that of a stump. The lower fragments of the bones and the bones of the foot are very soft and oily, while the upper part of the tibia retains its natural texture. The muscles of the back and inner side of the leg are in an advanced state of fatty degeneration; those of the outer side and sole of the foot, though small and pale, have preserved more of their normal structure.

Failure of Repair: Formation of False Joints.

812. Section of a tibia fractured transversely through the lower part of its shaft. The broken ends are closely approximated, though the upper portion is thrust, in some degree, outwards. No union has taken place between them. The cancellous tissue near the fracture is filled with a firm substance, and a small quantity of new bone has been formed on the surface of the wall. A portion of the wall of the bone, completely detached, is interposed between the fractured surfaces. *Hunterian.*

813. The right humerus of an Ostrich which was fractured just above the lower third of its shaft. The portions are not united, but the end of each is enlarged, by the accumulation of new bone around it, into a smooth oval mass of compact bone of more than twice the natural diameter of the shaft. *Hunterian.*

813 A. The lower portion of the leg and the foot of a child. The tibia has been fractured about two inches above the ankle-joint, and the ends of the bone have been united by dense connective tissue, with displacement of the lower fragment forwards and outwards. The fibula has also been fractured just above the external malleolus, and is similarly united. The walls of the tibia are very thin, and the medullary cavity is enlarged. The muscles are of healthy

texture, and the blood-vessels are normal in their distribution. The leg was covered by an unusually thick layer of subcutaneous fat.

From a child, four years old, whose leg was fractured by some slight injury at the age of one and a half years. Although treated in the ordinary manner the bones remained ununited; and an operation for the remedy of ununited fracture was performed at the Children's Hospital, Great Ormond Street, but without success. Subsequently the child was again submitted to operation at the Great Northern Hospital, the ends of the bones being sawn off and the cut extremities brought together with silver sutures. This also proving unsuccessful, amputation was performed.

The bone was found, with the microscope, to have undergone interstitial absorption; it contained numerous irregular cancellous spaces, separated by thin layers of osseous tissue, and filled with a growth of granulation and fibrillar connective tissue, which extended along the Haversian canals from the periosteum and the medullary membrane respectively; on the surface of the bone, where absorption had taken place, were numerous ostoclasts lying in Howship's lacunæ.

Presented by William Adams, Esq., 1882.

814. Part of a humerus fractured obliquely, and of which the portions are not united. The extremities of both portions are much enlarged; their surfaces are covered by a smooth fibrous tissue; the surface of one is convex, of the other concave. They are exactly fitted to each other, and are held close together by a tough fibrous tissue forming a kind of capsular ligament, of which half has been removed.

Presented by G. E. Ewbank, Esq.

815. A cast of the left humerus of the late Dr. Livingstone, the celebrated African explorer. It shows a false joint resulting from the failure of union of an oblique fracture of the shaft close to the insertion of the deltoid. The lower fragment is drawn-up on the inner side of the upper, and rotated slightly outwards. A small piece of detached bone, which was encapsuled, lies in front of the fracture. The shaft of the humerus is attenuated, especially above. It was one inch shorter than the opposite humerus.

The fracture was caused by the bite of a Lion thirty years

before Dr. Livingstone's death. It was by the condition of the left humerus that his body was identified by Sir William Fergusson when it was brought to England in 1874. (See 'Lancet,' vol. i. 1874, p. 565 and p. 888.)

Presented by Sir William Fergusson, Bart., 1874.

816. Part of a femur which was fractured near the junction of the upper and middle thirds of its shaft. New bone has been formed abundantly about the end of the lower portion, to which also a smaller piece of the femur appears to be united after having been detached and displaced. A smaller quantity of new bone has been formed on the end of the upper portion. No union, however, has been effected between them. The broken ends appear to have been in contact at the part where there is now a nearly flat oval surface covered by a substance with a cartilaginous aspect; they were held together by a tough fibrous substance, in which there is an irregular plate of bone.

From the Museum of John Heaviside, Esq.

817. Sections of the humerus of a large Monkey fractured across the middle of the shaft. The portions were displaced so that the fractured surfaces were not in contact; and no union has taken place between them. The broken ends are smoothly rounded, and held together by a tough fibrous tissue, forming a kind of capsular ligament round the cavity between them. Processes of the same tissue are also continued over parts of the fractured surfaces. The blood-vessels have been injected. *Hunterian.*

818. Parts of the femur, tibia, and fibula of a large Dog. The femur was fractured just above the condyles, and the portions are not united. The extremity of the upper portion, projecting forwards, is covered with fibrous tissue, which has an uneven polished surface and rested on the upper and anterior part of the lower portion. The portions were held together by a kind of capsular ligament, which is now laid open and which permitted a free motion between

them. The lower portion is fixed to the tibia ; behind it is a piece of dead bone, which lay in a fistulous passage opening externally. *Hunterian.*

819. Parts of the humerus, radius, and ulna of a Dog. The humerus was transversely fractured near its lower extremity three months before death. Its portions, though but slightly displaced, are not united ; their extremities are enlarged by the formation of bone around them, and the fractured surfaces are covered with a tough fibrous tissue. A similar tissue, forming a kind of capsular ligament, maintains the fractured portions in close apposition. The elbow-joint is almost immovably ankylosed.

From the Museum of George Langstaff, Esq.

820. Portions of a radius and ulna fractured transversely across the middle of their shafts. The upper portions project forwards and downwards, and their extremities are an inch distant from those of the lower portions. All the fractured ends are reduced in size, and their margins and surfaces are smoothly rounded and covered-in by compact tissue. Around each of them is a separate and distinct cavity, resembling a large *bursa mucosa*, with tough fibrous walls and a polished internal surface.

Presented by Sir William Lawrence.

821. Part of the humerus of an Ostrich in which, after a fracture, the two portions were widely displaced and are not united. Their extremities are smoothly rounded, and the space between them is occupied by a sac, like a large *bursa mucosa*, formed of dense fibrous tissue and lined by a polished membrane. This sac does not enclose the fractured ends of the bone, but is interposed between them, its outer walls being fixed to their adjacent surfaces.

Hunterian.

822. The upper part of a humerus, showing a fracture at the junction of its upper and middle thirds. The fracture

occurred more than four years before death. There is no trace of bony union, but the fractured ends are held together by a large cyst with thick walls, whose interior resembles a synovial membrane and bears numerous outgrowths which project into its cavity. This cyst contained a glairy fluid resembling synovia, and loose bodies, probably broken away from the outgrowths, which are shown in the next specimen.

From a man aged 68, who was admitted into St. George's Hospital in 1791 with a recent simple fracture of the right femur. No union occurred after eleven weeks' rest, and it was found that he had an ununited fracture of the right humerus from an injury received three years and nine months previously. He was made to walk on crutches, and within a few weeks the fracture of the femur began to unite. Some time later he died in the Hospital, of an acute intestinal disorder. The thigh-bone was found to be firmly repaired by bony union; the condition of the humerus is displayed in this specimen. (See "Some Observations on the loose Cartilages found in Joints," by Everard Home, Esq., F.R.S. &c., 'Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge,' vol. i. p. 233. London, 1793. The paper is published in Hunter's Works, vol. iii.)

Hunterian.

823. The loose bodies which lay in the cavity round the fractured ends of the bone in the preceding preparation.

Hunterian.

Other specimens from the same cavity are in No. 1933.

823 A. The lower end of the tibia of a Calf, which had been fractured *in utero* some time before birth. The two fragments are at an acute angle with each other, and the sharp end of the lower one has perforated the skin. There is no osseous union. From the margins of the wound an abundant crop of pyriform pedunculated bodies has sprung up, the largest being about the size of a small grape; they are of a dark brown colour, smooth on the surface and solid within, and are composed of fibro-cellular tissue. The calf was born alive, but immediately killed.

Presented by Robert Palk, Esq.

824. The middle third of a femur fractured obliquely. The fragments overlap, and there is a considerable interspace between the ununited ends, which are covered with granulation-tissue and held together by fibrous tissue forming a capsule similar to those shown in the preceding specimens.

From a woman 76 years of age. The fracture occurred on rising from the bed to which she had been confined for several months by internal disease. Death is stated to have taken place one month afterwards.

Presented by M. B. Garrett, Esq.

Subdivision C. *Gunshot Wounds and similar injuries.*

825. The head of a right humerus with a musket-ball lodged in it. The ball struck the groove between the greater tuberosity and the articular head of the bone, at its outer and posterior aspect, and is firmly fixed in the cancellous tissue of this part, its surface being on a level with that of the bone. A large part of the tuberosity has been broken away, and a horizontal fissure extends, in both directions, from the principal seat of injury more than halfway round the margin of the head of the bone.

From a British soldier wounded at the battle of Inkermann, November 5th, 1854. The head of the humerus was excised at Scutari, where the patient died on the 25th of November, with tubercle in the lungs and ulceration of the intestines. The specimen is referred to in "A Lecture delivered at the Royal College of Surgeons, April 14th, 1855," by G. J. Guthrie, Esq., F.R.S., 'Lancet,' 1855, vol. i. p. 415.

Presented by George J. Guthrie, Esq.

826. The head of a left humerus with a musket-ball lodged in it. The ball struck the top of the anterior portion of the great tuberosity and is partially imbedded in the cancellous tissue of this part, though the greater portion remains above the surface of the bone. A wide fissure extends obliquely

all round the upper end of the bone, passing through the great tuberosity and across the articular surface.

From a private in the Rifle Brigade, aged 21, who received the injury at the siege of Sebastopol, July 11th, 1855. On the 19th the head of the humerus was excised. The healing process went on favourably: and the man was discharged upon the 26th of August, quite well.

Presented by W. H. MacAndrew, M.D., Surgeon 57th Regiment.

827. The head of a right humerus with a conical rifle-ball lodged in it. The ball entered the anterior portion of the greater tuberosity and is imbedded in the cancellous tissue, its base being on a level with the surface of the bone and its apex directed downwards and inwards. The bone is much shattered, fissures extending in various directions from the situation in which the ball is lodged; and several large portions are completely detached.

From a private in the 57th Regiment, aged 21, wounded at the siege of Sebastopol in June 1855. Upon the 22nd of June the head of the bone was excised; and upon the 26th of August the man was discharged from hospital, quite well.

Presented by W. H. MacAndrew, M.D., Surgeon, 57th Regiment.

828. The right half of a skull with a small perforation, probably made by a pistol-ball, immediately below the temporal ridge on the parietal bone. It is circular in form, a quarter of an inch in diameter externally, but much larger and more irregular in shape on the inner side. Some of the lead from the ball still adheres to its margin. The condition of the sutures and alveoli indicates that the specimen is from an aged person.

829. The upper part of a skull, perforated by a musket-ball through the frontal bone, just above the glabella, a little to the right of the middle line. The aperture made by a piece of the bone being completely driven-in is irregularly circular, about three quarters of an inch in diameter, and

larger on the inner than the outer side. Three fissures radiate from it, one of which extends outwards and backwards to the middle of the right parietal bone. The piece of bone which was displaced by the ball, as well as a portion of the ball itself, very much misshapen, are preserved with the specimen.

From a private (Henry Hopecroft) in the 2nd Battalion of the Rifle Brigade, wounded at the siege of Sebastopol, Sept. 8th, 1855. He lived eight days after receiving the injury. The following extract from a letter from D.I.G. Taylor to Mr. Guthrie refers to this case :—"A ball struck the frontal bone, depressed some small pieces to the depth of the thickness of the bone, and then appeared to have made its exit about two inches from the point of entrance. The absence of urgent symptoms appeared to indicate this course of the ball. When, however, comatose symptoms set in, this apparent course of the ball was laid open, with a view to examine and raise, if necessary, the depressed fragment. But symptoms of collapse now set in, and further operative proceedings were deemed unadvisable. On post-mortem examination, it became apparent that the ball must have been divided by the fractured edge of the bone, one piece coming out at the forehead, the other coursing round the right hemisphere of the brain, between the dura mater and internal table, to a point in the posterior lobe corresponding to the opening of entrance. For the last three inches of this circuitous course the sharp fragment of ball had cut the dura mater, and through this slit there was hernial protrusion of the brain, which had separated the dura mater from the internal table to the extent of three inches in an upward direction. The tense edge of dura mater was deeply depressed in the hemisphere, and the protruded portion of brain had a livid strangulated appearance, so as to be taken, at first, for a large clot of blood. The piece of bullet was found, at the point previously indicated, buried in the cerebral substance about an inch from the surface. Division of the cerebral substance confirmed the fact of this circuitous course of the ball."

Presented by F. Wall, Esq., Surgeon 38th Regiment, and J. R. Taylor, Esq., D.I.G.

830. A portion of the right parietal bone perforated by a pistol-ball, which, with some fragments splintered from the inner table, are preserved. The characters of the opening are very like those in the preceding specimen.

From a gentleman aged 35. The injury was suicidal, and death almost instantaneous. The bullet ascended to the vertex dividing the superior longitudinal sinus, then passed downwards between the dura mater and the cranium, and lodged behind the

left temporal bone, lacerating the lateral sinus. Great effusion of blood occurred from both sinuses. The fragments of bone were found in the middle of the right cerebral hemisphere.

Presented by Dr. W. E. L. Fergusson, 1870.

831. The posterior half of the base of a skull, in which the occipital bone has been fractured by a piece of shell. The principal point of injury is the left side of the bone, between the external occipital protuberance and the lambdoid suture; here the trephine has been used. From this point a fissure extends downwards and forwards, passing close to the left condyle and terminating in the jugular foramen.

From a private (William Holmes) in the 20th Regiment, wounded at the siege of Sebastopol, August 24th, 1855. The following note accompanied the specimen:—"Symptoms of compression deferred five days."

832. A skull with extensive fracture splitting it in all directions.

The injury was caused by a man firing a pistol into his mouth. Probably the pistol was loaded with some explosive other than or mixed with gunpowder.

Accompanying the Jacksonian Prize Essay by Christopher Heath, Esq., 1868.

833. The lower part of a left femur with a recent comminuted fracture of its shaft caused by a charge of small-shot from a horse-pistol. Some of the shot extracted from the tissues have been placed in the glass tube attached to the side of the bone.

From a man, aged 29, who was accidentally wounded by a pistol-charge. The shot entered the thigh without scattering, fractured the bone, and made their exit in the popliteal space. The limb was amputated, and the patient recovered.

Presented by Alfred Poland, Esq., 1868.

834. The skin of the left thigh from the same patient as the preceding specimen, showing the apertures of entrance and exit of the shot. The wound by which the shot entered is

somewhat smaller and more evenly oval than that through which they escaped; the integuments at its margin are blackened. *Presented by Alfred Poland, Esq.*, 1868.

835. The upper part of a skull with a small leaden shot imbedded in the left parietal bone. There are two small and smooth superficial depressions near it, from which other shots were separated. The adjacent bone is quite healthy.

Hunterian.

835 A. Part of the frontal bone of an Elephant, in which a bullet, flattened and misshapen, is lodged in the frontal cells and tightly fixed between the walls of two of them. The aperture of entrance is larger than the bullet, and has undergone no repair. *Presented by —— Evans, Esq.*

836. Part of the humerus of a King Vulture (*Gyparchus papa*), by the side of which, just above the outer condyle, a bullet is tightly fixed upon a sharp-edged and pointed process of bone. The bullet was partly cleft by the edge of the bone. The upper end of this portion of the shaft also appears to have been broken; for its medullary tube is closed.

From the Museum of Joshua Brookes, Esq.

837. The upper half of a right humerus into which a musket-ball entered a little above the middle of the shaft and passed upwards, causing fracture and subsequent inflammation and necrosis of a considerable portion of the shaft. The sequestrum has come away, leaving an imperfect shell of new bone connecting the head and greater tuberosity with the lower part of the shaft.

The injury was received in Portugal; and the arm was amputated eleven months afterwards. The patient recovered in two months.

Presented by Sir Stephen L. Hammick.

838. The upper half of a humerus exhibiting necrosis of the shaft and head in consequence of a musket-ball wound.

New bone has been formed around the upper part of the shaft. The head separated in the process of maceration.

The patient recovered after amputation at the shoulder-joint.

Presented by Sir Stephen L. Hammick.

839. The lower half of a femur in the inner condyle of which a bullet, having entered through the front of the knee-joint, is lodged. A cavity has been formed, in which the bullet now rolls loosely and which opens posteriorly by an oblique canal passing through the back of the shaft. A small quantity of new bone is formed upon the condyles; and their articular surfaces appear ulcerated.

From the Museum of Robert Liston, Esq.

840. Part of a femur which was fractured by a bullet in its middle third. The bullet remained between the fractured portions; but they are united, with shortening and distortion, by broad and strong bridges of bone passing from one to the other. A large round cavity, from which the bullet was at last removed, remains in the middle of the bonds of union. The surface of all the bone by which the fracture is united is rough, like that of bone that has been superficially ulcerated. *Hunterian.*

841. The lower part of a right femur in which is a longitudinal fracture extending from between the condyles upwards and obliquely outwards for about seven inches. A bullet which entered at the middle of the line of fracture is lodged in a cavity in the shaft, nearly the whole of which is covered with a thin layer of new bone. A portion of this layer serves for the union of the greater part of the line of fracture. There is no similar union in that part of the fracture which extends between the articular surfaces of the condyles.

The injury was occasioned by a grape-shot at the battle of Corunna; and the limb was amputated nine months afterwards in the Naval Hospital at Plymouth. The patient quickly recovered.

Presented by Sir Stephen L. Hammick.

842. The lower half of a young person's tibia from which a portion of the inner wall exfoliated after necrosis. The dead bone is encompassed by a broad shallow groove, formed by ulceration through a layer of new bone, which covers the greater part of its surface as well as that of the adjacent living bone. An aperture in the centre of the dead piece of bone leads to a canal which traverses the whole thickness of the shaft from before backwards, and is like the track of one or more small shot. *Hunterian.*

843. The metacarpal bone of an Ass through the middle of the shaft of which a small hole was bored long before the death of the animal. The walls of the shaft around the hole are considerably thickened by new bone formed on their surface. New bone has also been formed in a very thin layer on other parts of the shaft. *Hunterian.*

844. Sections of the metacarpal bone of an Ass through which a similar but larger hole was bored in the upper part of the shaft. Similar changes have ensued on the exterior; but the medullary tube appears unaffected. *Hunterian.*

845. Sections of the metacarpal bone of an Ass similarly bored through the middle of its shaft. They exhibit a greater increase of thickness of the wall around the apertures, in consequence of new bone formed on its surface and closely united with it. That part of the medullary tube which immediately surrounds the passage through it is also nearly filled up by new bone. *Hunterian.*

846. A transverse section of the metatarsal bone of an Ass showing similar changes. *Hunterian.*

There is no record of the intention with which the experiments shown in the last four preparations were made. The specimens are placed here because the injuries inflicted on the bones resemble gunshot- and other penetrating wounds more than they do any other accidental injuries of bones. Possibly the experiments were made to examine into the changes which have taken place in some of the preceding specimens.

Other specimens of Gunshot Wounds and similar Injuries of Bones are 873 to 877, 903, 966 to 968; and, as indexed, among the following specimens of fractures of each of the several bones, p. 100.

Subdivision D.

Fractures and Wounds of the Several Bones of the Skeleton.

Bones of the Skull: 847 to 877, 758, 778–9, 835, 835 A.
 Recent wounds: 847 to 849, 860.
 Various fractures: 850 to 858, 869 to 872, 3751.
 Healed wounds: 859 to 868.
 Gunshot wounds: 873 to 877, 828 to 832.
Bones of the Face: 878 to 880, 875.
Hyoid Bone: 881.
Spine. See Series.
Sternum: 882.
Ribs: 883 to 896, 763, 765–6, 2049.
Scapula: 897 to 903, 1734, 1739.
Clavicle: 904 to 910, 772.
Humerus.
 Upper end: 911 to 914, 1740, 1751 to 1754, 1759.
 Shaft: 915 to 931, 734 to 736, 747–8, 759, 769, 775–6, 786, 789, 806, 813 to 815, 817, 810, 821 to 823, 1119.
 Lower end: 932 to 936, 819, 1834.
 Gunshot wounds: 925–6, 825 to 827, 836 to 838, 1119.
 From animals: 937 to 940.
Ulna: 950, 952, 953, 956, 764, 768, 820, 1834.
 Olecranon: 941 to 947, 952.
Radius: 804, 948–9, 951, 952, 777, 800–1, 804, 820, 1834.
 Lower end: 954 to 956 A.
Metacarpus: 957–8.
Pelvis: 959 to 965, 1762.
 Gunshot injuries: 966 to 968.
Femur: 969 to 1054.
 Neck.
 Within the capsule: 969 to 1002.
 Ununited: 969 to 976, 981.
 Fibrous union: 977–8, 980, 982 to 987 C.
 Osseous union: 988, 989, 991 to 993, 998 to 1002.
 Doubtful: 990, 996 to 999.
 External to the capsule: 1003 to 1014.
 Shaft.
 At or near the trochanters: 1015 to 1024.
 By gunshot: 1017 to 1021.
 Below the trochanters: 1022 to 1054, 669, 681, 713, 737 to 744, 749, 759, 773, 785, 787–8, 791 to 795, 798–9, 802–3, 809, 810, 816, 824, 1118.
 At the lower end: 1036–7, 1039, 1041 to 1045, 754 to 757, 818.
 By gunshot: 1044, 1046, 1049, 1050, 1053, 833–4, 839 to 841.
Patella: 1055 to 1076.

Tibia and Fibula: 1077 to 1110, 750 to 753, 760 to 762, 771, 774, 784, 790, 796–7, 805, 807–8, 810, 811–2, 1122–3, 1167, 1769, 1771–2.
Gunshot: 1110, 842.
With necrosis or other complications: 1095 to 1103, 1106, 842.
Bones of the Foot: 1111 to 1114, 1075–6.
Gunshot: 1111, 1114, 843 to 846.

Varieties of Fractures.

Incomplete: ? 1009.
Transverse: 765, 767, 791, 890.
Oblique: 792, 802, 814, 824, 889, 1035 to 1037, 1039.
Longitudinal: 802, 926, 932, 936, 1012, 1017.
Stellate: 778, 853, 854.
Comminuted: 792, 795, 797, 798, 802, 858, 933, 1771, 963, 964, 1001, 1009, 1026, 1078.
Compound: 751, 794, 800, 801, 804, 807, 1042 A, 1082, 1084, 1122, 1834.
Complicated: 808, 868, 961, 962, 968, 1045, 1052, 1771.
With marked separation of fragments: 756, 779, 792, 796, 797, 800 to 802, 812, 866 to 868, 880, 960, 1050.
With extreme displacement: 760 to 762, 811, 910, 940, 752, 1005, 1010, 1011, 1015, 1025, 679, 680, 1030.
Separation of Epiphyses: 956 A ?, 987 C ?, 1041, 1103.
Gunshot wounds and similar injuries: 825 to 846, and footnote p. 99.
Fractures of diseased bones: 1032, 1033, 681, 679, 702, 713–4, 736 to 741, 743–4, 1631, 1644, 1646, 1671 to 1673, 1675–6, 1689, 1705–6, 1717.
Multiple Fractures: 679, 713–4, 810, 892 to 896, 902.

Fractures and other such Injuries of the Skull.

847. The skull of a native of India with three deep cuts, probably from a sabre, which seem to have been inflicted from above and the right side. The first, three inches in length, is near the middle of the frontal bone; a piece of the bone, bounded on one side by the cut, and an inch and a quarter in breadth, is completely broken out. The second has incised the zygomatic process of the right temporal bone, and then extends through the greater part of the parietal bone. The third passes upwards and backwards from the root of the zygomatic process of the temporal bone, through the squamous portion of the same bone and the lower part of the parietal, almost to the posterior extremity of the second wound. The portion of the skull situated between the two last is broken into several pieces.

Received from India during the Sepoy rebellion, 1857.

848. A skull exhibiting two short but deep sabre-cuts penetrating the entire thickness of the bone. One is in the middle of the left parietal bone, the other at the upper part of the frontal bone rather to the right of the middle line. The direction of both is the same, obliquely forwards and to the right. At the anterior inferior angle of the right parietal bone a piece of the outer table is broken or cut away, as is also the contiguous portion of the great wing of the sphenoid.

Found by the donor on the field of Waterloo, five years after the battle.

Presented by Thomas Wormald, Esq.

849. The skull of a Chinese, exhibiting numerous recent wounds and fractures. Five portions of the skull have been cut away, probably by sword-wounds, from the frontal and left parietal bones; and long fissures extend from similar wounds through the parietal, the occipital, and the right temporal bones. The right malar, superior maxillary, and nasal bones are also cut across; and on the left side of the frontal bone is the scar of a wound, with a loss of substance, which was probably inflicted long before death.

Presented by John Morgan, Esq.

850. Part of a skull which was extensively fissured. The chief force of the injury appears to have fallen upon the upper part of the lambdoid suture; for here a portion of bone, nearly surrounded by fissures, is slightly depressed and starred at its centre. From the fissures surrounding this part, two others extend across the parietal bone to the left temporal bone, and a third, nearly in the course of the obliterated sagittal suture, to the right superciliary ridge of the frontal bone. None of the fissures are closed, but their margins are smoothly rounded. *Hunterian.*

851. The lower portion of a frontal bone and the adjoining portions of the nasal bones. A puncture passes through the orbital plate, entering by the side of the right internal angular process, and opening into the skull about half an

inch to the right of the crista galli. The puncture is marked by a portion of whalebone inserted into it.

The specimen was taken from a butcher's boy, aged 13 years, who inflicted the injury on himself while cutting a skewer, probably by thrusting the skewer into the orbit. Death took place four days after the accident, apparently owing to fresh hæmorrhage effused into the skull from a fall after the external wound had closed. (See 'Edinburgh Monthly Journal of Med. Sci.' 1842.)

Presented by Dr. Peacock, 1876.

852. The upper part of a skull on which the trepan had been used twice in the course of the coronal suture. Of the sagittal suture only a small portion remains at its junction with the coronal; and from the end of this portion a fissure extends into the right parietal bone. *Hunterian.*

853. The upper part of a skull in which there has been a starred and circumscribed fracture, with depression, on the right side of the frontal bone. The depressed portion is oval, and measures an inch and a quarter by two inches; the depth of the depression is, at the centre, nearly half an inch. The fracture has been healed, though the radiating lines in which it extended are distinct. These lines on the outer and inner table do not exactly correspond; and the fracture surrounding the depressed portion appears to have extended only through the outer table. The tissue of the depressed bone is consolidated.

The patient was a Life-Guardsman who received a kick from his horse in the situation of the fracture two years before his death. He was stunned for a short time; but no further signs of cerebral disorder ensued, and when the wound of the scalp was healed he left the barrack-hospital well. He died of phthisis.

From the Museum of R. B. Walker, Esq.

854. A frontal bone in the middle and upper part of which a fracture, with depression, occurred. The depressed portion is about an inch and a half in diameter. Through the external table a fissure seems to have extended completely round the depressed portion: the internal table was fissured

through the greater part of the same circumference and, besides, in three lines radiating from its centre. All these fissures, as well as others which pass through the external table, from the circumference of the depressed portion towards the external angular processes of the frontal bone, are so united that their course is indicated only by a narrow depressed line with a few small circular pits. The outer surface of the depressed portion is smooth, but perforated by an unusual number of vascular canals.

From the Museum of Joshua Brookes, Esq.

855. The upper part of the skull of a seaman who received a fracture of the right parietal bone. In the antero-inferior region of the bone is an irregularly oval aperture, about an inch and a half long and one inch deep, with smoothly rounded bevelled edges, from which ossification had commenced to extend into the portion of dura mater which closes the aperture.

Presented by Sir Stephen L. Hammick.

855 A. A skull with a circular depression near the centre of the frontal bone, about half an inch in depth and five eighths of an inch in diameter. The depression evidently resulted from a depressed fracture, as shown by the existence of a linear fissure at the posterior margin of the concavity; the fracture has otherwise been evenly and firmly united.

Presented by Thomas M. Stone, Esq., 1882.

856. The upper part of a skull in which a small portion of the centre of the frontal bone has been fractured and slightly depressed. There is a deep cavity in the place of the fracture; for the outer table and diploe have been removed, the fracture having probably been a compound one and followed by necrosis or ulceration. The fractured portion of the inner table was nearly detached, but is reunited.

857. The upper part of a skull in which there has been a cir-

cumscribed fracture, with central depression, of the lower and anterior part of the left parietal bone. A piece of bone was removed from the posterior margin of the fracture; but the portions were imperfectly, if at all, elevated. They have, however, united firmly; and, by the closeness of the union and the smooth roundness of their margins, it is probable that the patient lived a long time, although one narrow portion of bone projects inwards half an inch below the level of the surrounding parts.

858. A skull in which there has been a circumscribed and comminuted fracture of the middle and lower part of the frontal bone. The upper margin of the fractured portion is depressed about a quarter of an inch, but it is in part united smoothly to the inner table of the bone around it, and all the fissures extending from it are nearly closed. The broken edges also are smoothly rounded.

859. Part of a skull, on which a wound was inflicted immediately above the left orbit and the frontal sinuses, laying open both those cavities. The greater part of the wound over the frontal sinuses is closed; but that through the anterior and upper wall of the orbit remains wide open, though its margins are smooth and cicatrized.

860. Part of a skull on which a deep oblique wound was inflicted near the middle of the frontal bone. A portion of the outer table and diploe was broken into three pieces and nearly detached; but complete reunion has taken place, though the deeper edge of the wound remains open. The inner table of the skull was not injured.

861. Part of a skull on which a wound was inflicted through the outer table of the left side of the frontal bone. The wound is nearly filled up and its margins are smoothly bevelled.

862. A skull on which two deep and large wounds were inflicted, one upon the upper part of the left parietal bone, the other across the left and upper part of the lambdoid suture. Neither of them appears to have implicated the inner table. Both of them are healed, with partial filling-up of the gaping borders of the wounds, and a nearly complete obliteration of the fissures leading from them. There are appearances of superficial cicatrization over a great part of the right parietal and the left side of the frontal bone, which were perhaps the consequence of extensive suppuration beneath the scalp.

863. Part of a skull on which a wound was inflicted which cut obliquely through the whole thickness of the upper part of the left parietal bone. The portion of bone raised-up by the cut has not been replaced; but its margins are smoothly rounded and a fissure which was made in it has nearly closed. The margins also of the opening in the inner table at the deepest part of the wound are smooth; and the rest of the wound is in great measure filled-up and healed. There is also a cicatrix of a smaller and more superficial wound on the middle of the frontal bone.

864. Part of a skull on which a wound was inflicted which cut obliquely through the left half of the frontal bone, and cracked the same bone from its centre to the edge of the right orbit. The fissure is nearly closed and the wound, though wide open, has its margins smoothly rounded, as if healing had been nearly accomplished.

865. A skull from which a portion of the frontal bone, including both its tables, was nearly cut off by an oblique wound. One edge of the wound remains open, with smooth shelving healed borders; the rest is nearly closed and the broken portion is firmly fixed.

866. A skull on the parietal bones of which three wounds have been inflicted. One, which has cut, in a great part of its

extent, through the whole thickness of the bone, nearly detached an oval portion more than two inches in its greatest diameter; the others are smaller and more superficial, but by one of them a small piece of bone appears to have been completely detached. The wounds have all healed to the same extent and in the same manner as in the preceding specimens, and, as in all of them, without any considerable production of new bone; and the detached piece of bone has been fixed again near the place from which it was removed.

867. A skull on which a very broad deep wound was made through the anterior surface of the frontal bone. The wound is more than three inches long, and its edges are nearly an inch apart. The same kind of healing has occurred as in the preceding specimens, and portions detached from one of the margins of the wound have been re-united. Another obliquely penetrating wound, about an inch long, in the occipital bone, is similarly healed.

868. A skull from which a portion, nearly three inches in diameter, was cut off the middle and left side of the occipital bone, and was by the same blow broken into several pieces. The pieces are all re-united; and the whole portion of bone, after having been forced nearly half an inch from its original situation, has been firmly fixed to the contiguous part of the skull. The gaps thus left in the skull have had their margins made thin and smooth, but do not appear to have been at all filled-up by bone. The wound must have passed through the left lateral sinus, and through the end of the longitudinal sinus, cutting off the torcular Herophili.

The last thirteen specimens were found in a burial-ground at Hesse-Cassel, and were purchased from the Museum of John Heaviside, Esq.

869. Part of a parietal bone in which there has been fracture, with depression of one margin of the fractured portion. The depressed margin, together with the pericranium

attached to it, was pushed under the edge of the adjacent bone. *From the Museum of Sir A. P. Cooper.*

870. A right temporal bone which was fractured two years before the patient's death, together with part of the occipital bone. The line of fracture passes nearly straight downwards, through the squamous portion of the temporal bone, to the upper margin of the meatus auditorius externus; thence it proceeds along the upper wall of this passage, a part of the anterior wall being destroyed, and opposite the cavity of the tympanum it branches in two directions: by one of these branches the fracture extends through the posterior and lower border of the petrous portion of the bone into the jugular fossa, which it traverses; by the other it extends through the upper border of the same portion of the bone; and there is a considerable loss of substance near the outer wall of the skull. That part of the fracture which lies in the squamous portion of the bone is, with the exception of a few minute apertures, closely and smoothly united; but, in the part which traverses the petrous portion of the bone, there are only two or three small points at which union has taken place.

The patient was an engineer. After the injury he was in St. George's Hospital with symptoms of fracture of the base of the skull, from which, however, he recovered, and returned to his work. Two years afterwards he was thrown from a railway-carriage and killed by fracture of the cervical vertebræ.

Presented by Henry Lee, Esq.

871. The greater part of a skull in which the posterior and inferior region of the left parietal bone has been the seat of a fracture. A considerable portion of bone has been removed, leaving a very irregular aperture. Above this is another and more circular hole, made with a trephine. The margins of both of these have become rounded and partially healed. Nearly the whole external surface of the cranium and parts of the inner surface bear traces of having been inflamed, as shown either by superficial deposition of new bone or by shallow ulcerations. Exfoliation has taken

place to a considerable extent on the occipital bone, in some parts implicating its entire thickness.

The injury was occasioned by the patient, a fine, healthy seaman about 50 years of age, falling and striking his head against a ring-bolt. Although the fracture was not depressed, the trephine was applied a few hours after the accident, as was then [1827] the general custom in such cases. The man died, exhausted by the discharge from the wounds, ten months afterwards. He retained his senses during this period, and for many weeks was able to walk even beyond the wards of the hospital.

Presented by Sir Stephen L. Hammick.

872. The upper part of a skull which was fractured near the meeting of the coronal and sagittal sutures. There appears to have been but little injury to the inner table; and complete healing has taken place, but with much irregularity of the outer surface of the skull.

Presented by Sir William Blizard.

873. The skull of a Russian soldier. It has a bullet-hole through the centre of the left parietal bone. The perforation is oval, seven eighths of an inch in length, wider in front than behind; and its long diameter corresponds with the long axis of the skull. The margin is sharply defined, finely undulated, without any fissures extending from it. The inner table is removed, to the extent of one eighth of an inch all round the circumference more than the outer. Some lead adheres to the posterior margin of the hole and is partially imbedded in the cancellous tissue of the diploe. There is no second aperture; and it may be presumed that the bullet lodged within the cranial cavity.

Found on the field of battle, Crimea, 1855.

874. Part of a skull, with an extensive comminuted gun-shot fracture. The principal seat of injury is the upper and inner side of the left orbit. Two considerable fragments are displaced from the supraorbital ridge of the frontal bone; above this is a circular opening, made by the trephine. The nasal process of the left superior maxilla

is broken off and driven inwards with part of the nasal bone. The right nasal bone and both the lachrymal bones are also fractured. The central plate of the ethmoid bone and the crista galli are lost. There is a large opening on the inner side of the roof of the left orbit and in the posterior wall of the frontal sinus; and a fissure extends across the base of the right lesser wing of the sphenoid bone and partially across the greater wing.

From a private in the Royal Artillery, aged 23, struck by a piece of shell at the siege of Sebastopol, 1855. On admission into hospital he was in possession of all his mental faculties, and had no paralysis of either of the extremities. There was a lacerated wound on the forehead, three inches in length, effusion of blood into the cellular tissue of the eyelids, so as nearly to close them, but no bleeding from the nose or ears. The following day symptoms of compression of the brain came-on; trephining was resorted to, but without relief, and he died in the evening. On post-mortem examination great ecchymosis was found beneath the scalp and in the cellular tissue of the eyelids. The bones were found fractured as seen in the preparation. The crista galli of the ethmoid was held in place by dura mater only. The left anterior lobe of the cerebrum close to the olfactory nerve was indented and ecchymosed. A small quantity of bloody serum was effused at the base of the brain.

Further details of the case may be found in the 'Lancet,' 1856, vol. i. p. 257.

Presented by Henry Rooke, Esq.

875. Portion of frontal bone from the outer part of the right orbit, detached by a gunshot injury.

The following account of the case is taken from the 'Medical and Surgical History of the British Army in the Crimea,' vol. ii. p. 291:—"A private (Francis O'Brien) in the 4th Regiment, aged 18, was wounded at the siege of Sebastopol, July 24, 1855, by a Minié rifle-ball, in the right temple. It penetrated the skull, and passed downwards towards the right orbit, driving out a considerable portion of the supraorbital ridge, which lay imbedded in the loose cellular tissue of the upper lid, and which, being mistaken for the ball by the medical officer in the trenches, had been by him cut down upon but not removed. The ball was then supposed to have dropped out of the opening of entrance. No symptom of cerebral disturbance followed the receipt of the injury; and though the patient was attacked with erysipelas of the face in the course of two or three days, no serious constitutional disturbance followed. A thin, serous discharge escaped from the wound; and to this fluid, when collected in the small cup-like

cavity formed by the passage of the ball through the bone, an evident pulsation was imparted by the brain. About a month after the receipt of the injury, the portion of the bone imbedded in the upper eyelid was removed by the knife; but so firmly did it adhere, that this was a work of considerable difficulty. On the following morning the ball dropped from the wound.

"On the 29th of September he left for England, his state being as follows:—Right eye closed, but whether by ptosis or mechanical obstruction it was impossible to say—probably by both; right pupil dilated, but, though the sight of that eye was wanting, it contracted when the other eye was exposed to a strong light. The wound in the temple had long healed, but was still most sensitive to the touch; and when excited or fatigued by long standing, a kind of convulsive action of the muscles of the face occurred.

"During the voyage home he is stated to have had a fit. He was admitted at Brompton Hospital on the 15th of November, 1855. On the 20th of November, and again on the 20th of December, small pieces of bone, portions of the superciliary arch, were removed through the wound in the upper eyelid, which was open on admission at Brompton. The headaches, from which he had previously suffered much, began to be less severe, and he was discharged, cured, 5th of January, 1856."

Presented by R. V. De Lisle, Esq., Surgeon 4th Regiment, and J. R. Taylor, Esq., Deputy Inspector-General.

876. Portion of a right parietal bone which was perforated by a bullet from without inwards. The pieces broken-out by the passage of the ball have all been preserved and are fixed in their places with wire. The aperture in the outer table is irregularly oval in form, an inch and a half long, and one inch wide. The bone occupying this space is broken into seven pieces. From the inner table a larger piece, of circular form, and divided into four fragments, is split-off. A mass of lead, of very irregular shape, is lodged between the fragments at the posterior end of the aperture.

877. A parietal bone in which are two deep depressions of the external table and diploe, consequent on the lodgment and subsequent discharge of two shots. At the bottom of one of them is a small perforation of the inner table; but in other respects all the adjacent bone is healthy. *Hunterian.*

Other specimens of Fractures of the Skull are 758, 778-9, 828 to 832, 835, 835A; and for the results of trephining see 872, 3750, 3808 to 3817.

Fractures of the Bones of the Face and of the Hyoid Bone.

878. Part of a skull. The ossa nasi have been fractured transversely across the middle of their length, and are reunited, with a slight lateral displacement of the lower portions. These portions are also united by bone to each other and to the superior maxillary bones. *Hunterian.*

879. A portion of the alveolar margin of the lower jaw, containing the left canine and incisor teeth. A violent blow on the jaw had produced a vertical fracture through the symphysis, with a horizontal fracture extending from the vertical one along the alveolus on the left side, so that the portion here displayed was completely separated.

From a man aged 60. This detached piece of bone, being merely held to the jaw by a portion of gum, was removed on the sixth day after the injury.

Accompanying the Jacksonian Prize-essay, by Mr. Christopher Heath, 1867.

880. A nearly edentulous lower jaw which was fractured through its right side about an inch anterior to the angle. The portions are united smoothly and with very little displacement.

From the Museum of Joshua Brookes, Esq.

881. A hyoid bone showing a want of symmetry between the two greater cornua. The right cornu is supposed to have been fractured "at least a couple of years before death," and to have reunited. Its free end is enlarged and nodular.

The case is recorded and figured in the 'Trans. Path. Soc.' vol. xiii. p. 173.

Presented by Dr. G. Duncan Gibb, 1868.

Fractures of the Sternum and Ribs.

882. The sternum of a Fowl with an unevenly united fracture extending from the apex to the base of the keel. At its

anterior extremity the fractured portions are separated by the lateral displacement of the posterior fragment.

This injury is said to occur occasionally to heavy birds in springing from their perch to the ground.

Presented by — Mawer, Esq., 1882.

883. Portions of three fractured ribs. The broken extremities are slightly displaced and no union has been effected.

Hunterian.

884. Part of the fractured rib of a Cow, of which the broken portions have been partially united by new bone formed on their adjacent margins. *Hunterian.*

885. A left rib, probably the seventh. Almost immediately in front of the angle, on the inner side, is a sharp ridge of bone; it is oblique, best marked below and V-shaped with the apex pointed backwards. It appears to mark the site of an old fracture, with very slight displacement of the anterior fragment inwards; but no indication of any injury can be detected on the outer surface of the rib.

From the skeleton of King Robert the Bruce of Scotland. Many years before his death the rib was injured at a jousting-match in England. When his coffin was opened in 1822, and the body identified, the rib was removed by the late William Mackenzie, Esq., F.R.C.S.

Presented by Mrs. Mackenzie, 1879.

886. A second rib, fractured through its middle, and united without displacement of the portions. The situation of the fracture is indicated only by a rough thickening of the borders and the inner wall. *Hunterian.*

887. An eleventh rib, fractured through its middle, and united without displacement, but with considerable thickening and the formation of ridges of bone on both its borders.

Hunterian.

888. A nearly similar specimen. These three were, probably, taken from the same person. *Hunterian.*

889. The rib of an Ox which was fractured very obliquely and into three or four pieces. Its portions are united imperfectly, the dorsal portions having been drawn forwards from the sternal one; but there is no lateral displacement, and the union is firm. *Hunterian.*

890. Part of the rib of an Ox fractured transversely. Its portions are united with but little displacement—imperfectly on the outer side, but very firmly and with considerable thickening on the inner wall. *Hunterian.*

891. A false rib from some large mammal. It was only partially ossified; but it was fractured in several places, and its portions are united by rings of bone. *Hunterian.*

892. The first left rib of an Ostrich fractured near its head, and reunited with considerable lateral displacement of its portions and with a large accumulation of bone. *Hunterian.*

893. The second left rib of the same Ostrich, similarly fractured and repaired. *Hunterian.*

894. The third left rib of the same Ostrich, similarly fractured and repaired. *Hunterian.*

895. The seventh left rib of the same Ostrich, fractured at a greater distance from its head, and reunited with less displacement and less accumulation of bone. *Hunterian.*

896. The eighth right rib of the same Ostrich, fractured and repaired like the rest. *Hunterian.*

Other Fractures of Ribs: 763, 765, 766.

Fractures of the Scapula.

897. Three scapulæ from Rabbits, in each of which the acromion process was broken across and is united by bone firmly and with very little displacement of its portions. A perfect scapula is placed with them for comparison.

Presented by Joseph Swan, Esq.

898. The scapula of a Dog from which three portions were removed with a small trephine some months before death. All the apertures have been smoothly filled-up with new bone.

From the Museum of Sir A. P. Cooper.

899. A right scapula which was split from its base through a part of its infraspinal fossa. The fissure is not closed, but osseous matter is formed about its margin. *Hunterian.*

900. A right scapula which appears to have been fractured and repaired in several places. The various lines of fracture are indicated by ridges of bone in the following situations :— One surrounds the base of the acromion, including part of the spine, as if this portion of the bone had been completely detached. A second, continuous at both ends with the above, passes through the suprascapular notch, and crosses the anterior costa about an inch below the glenoid fossa, marking off a portion which includes the head, neck and coracoid process. A third implicates the anterior costa only, and is situated about an inch below the last ; it can be traced as far as the centre of the bone on both dorsal and ventral surfaces. The fragments are all in very good position, but the glenoid fossa is turned slightly more backwards than usual.

From a dissecting-room subject, without history.

Presented by Thomas Wormald, Esq.

901. The scapula of a Lion, of which a part of the base appears to have been broken off. Osseous matter is formed along the margins of the fracture. *Hunterian.*

902. Part of the left scapula of an Ostrich, probably the same Ostrich as that from which the fractured ribs (Nos. 892 to 896) were taken. It is fractured through its long axis. The portions were rather widely separated, but are united by a layer of bone placed between their adjacent surfaces, and their fractured ends are smoothly rounded.

Hunterian.

903. A scapula fractured in several directions through its spine and fossæ by a bullet, which is still lodged in the spine, but is flattened and misshapen. It appears to have passed through the supraspinous fossa from the front.

Fractures of the Clavicle.

904. The clavicle of an old woman which was fractured obliquely through the middle of its shaft. The scapular portion lies behind and below the clavicular; but they are firmly united by an intermediate layer of bone: their ends are rounded off; and the medullary tube is closed at the end of each.

From the Museum of John Howship, Esq.

905. A clavicle fractured obliquely through the middle of its shaft. The scapular portion has passed directly under the clavicular one; and in this position they are smoothly united by intermediate new bone.

906. A right clavicle fractured through the middle of its shaft and repaired, with considerable displacement of its portions. The scapular portion has passed far under the sternal one; and they are united by a large irregular bridge of bone. *Hunterian.*

907. A left clavicle fractured in the same situation and also repaired, with considerable displacement. The scapular portion has passed behind the sternal one; and the bridge of bone uniting them is smooth and flat. *Hunterian.*

908. A left clavicle fractured obliquely through the middle of the shaft. The scapular portion has passed behind the sternal one. Firm union has taken place. The bone has been longitudinally bisected.

Presented by Sir Stephen L. Hammick.

909. The right clavicle of an adult showing union of a comminuted fracture about the junction of the inner with the middle third. The fracture appears to have been partly across and partly in a line with the long axis of the bone.

Presented by Dr. Thurnam, 1870.

910. A right clavicle which received a comminuted fracture near the middle. There is considerable overlapping of the fragments, the outer one being placed below the inner. A splinter, nearly an inch in length, projects forwards at a right angle to the axis of the bone. The fragments are united, but not very firmly, by recently formed osseous matter.

Presented by Sir Stephen L. Hammick.

Fractures of the Humerus, arranged according to situation from above downwards.

911. Section of the upper part of a left humerus fractured through the base of the head, just above the tuberosities, together with portions of the acromion and coracoid processes broken and detached from the scapula. The separated head of the humerus appears to have been so displaced that its articular surface is turned forwards, a part of its posterior margin alone remaining in connection with the glenoid cavity. The shaft appears to have been forced upwards and backwards, and to have had its upper end partly driven into the cancellous tissue of the head. A considerable quantity of new bone is formed around the fractured portion of the humerus, especially upon the upper part of the shaft, which has thus been reunited with the head ; but little union has taken place between the adjacent parts of the cancellous texture of the head and shaft. The fractured

portion of the acromion is nearly in contact with the head of the humerus: both it and the coracoid process were united to the scapula by ligamentous tissue.

The patient was a robust gentleman, 77 years old; and the injury was received in a fall from a cabriolet upon the left shoulder. Half an hour after the accident the power of the arm was lost, the shoulder was enormously swollen, and its roundness diminished; a depression existed in the belly of the deltoid muscle; a hard tumour was felt under the clavicle on the edge of the glenoid cavity, close under the coracoid process. A crepitus was perceived; and the arm was an inch shorter than the sound one. The bones were replaced without much difficulty. As the tumefaction diminished there appeared a flatness on the upper part of the shoulder, and a large hard tumour, like the head of the humerus, was distinguishable in the situation of the coracoid process. Considerable motion of the arm was regained; but it could not be raised to a level with the shoulder or be brought forward across the chest. The patient died of apoplexy nine weeks after the accident.

The case is published by Sir A. P. Cooper, together with figures of the specimen, in a paper "On the Dislocation of the Os Humeri upon the Dorsum Scapulæ," &c., in the 'Guy's Hospital Reports,' vol. iv. (London, 1839), p. 279, pl. iv.

From the Museum of Sir A. P. Cooper.

912. Section of the upper part of a humerus of which the shaft was fractured immediately below the tuberosities, in a plane extending transversely from the lower margin of the head. The fractured portions are united, chiefly by superficial formations of bone, as in bridges around the fracture; the shaft is drawn a little upwards and inwards.

913. The other section from the same humerus.

From the Museum of Sir A. P. Cooper.

These specimens are figured with the paper just referred to, by Sir A. P. Cooper, pl. iii. p. 278.

914. A left scapula, clavicle, and humerus. The great tuberosity of the humerus, with an adjacent portion of the border of the head, has been broken-off. It is firmly reunited to the shaft, though but partially, for only one border of it is fixed and the rest is widely separated. Below it some small splinters seem to have been broken from the shaft and re-

united. There is some superficial ulceration and formation of bone around the margin of the glenoid cavity of the scapula. *Hunterian.*

915. A left humerus fractured almost transversely through the upper part of the shaft, in a plane extending from the lower margin of the head to the lower part of the tuberosities. The portions are reunited in almost exactly their original relations, but with a small accumulation of new bone on the inner side of the fracture.

From the Museum of Robert Liston, Esq.

916. A vertical section of a humerus similarly fractured. The portions are little displaced; and a slight union has been effected by new bone formed round the line of fracture. Light new bone has also been abundantly formed upon the surface of the upper part of the shaft, and, in one situation, appears traversed by an ulcerated canal. The cancellous tissue in the upper portion appears unaltered since the occurrence of the fracture.

917. A right humerus which was fractured transversely just below its tubercles. The upper end of the shaft appears to have been drawn forwards, and is united by a short bridge of bone to the anterior border of the head and neck. The head and its tubercles are reduced to a disk-like mass, less than an inch in thickness, and having externally a smooth flat surface continuous with the outer wall of the shaft. The articular surface of the head is ulcerated at its centre; and bone is irregularly accumulated around its margin.

Hunterian.

918. A right humerus, fractured and repaired in almost exactly the same manner as that last described. It was also fractured obliquely through the lower third of its shaft; and these portions are united with a slight lateral displacement.

Hunterian.

919. A left humerus fractured obliquely just below the head and

the tuberosities. The portions are firmly united; but the shaft is drawn inwards and a little forwards, so that it is placed almost directly under the head, and the prominence of the tuberosities is greatly diminished. *Hunterian.*

920. A nearly similar specimen, with a large ridge of bone formed on the outer margin of the bicipital groove.
Hunterian.

921. The left humerus of a woman, 77 years old, which was fractured obliquely just below the margin of the head and through the tubercles. The shaft is drawn forwards, upwards, and inwards; the outer surface of its upper end is united by bridges of bone to the broken surface of the head and neck; and the anterior fourth of the head rests in a cavity on the top of the shaft.
From the Museum of John Howship, Esq.

922. The right humerus of a woman, 79 years old, which was fractured transversely below the tubercles and half an inch below the lower margin of the head. There was considerable displacement of the portions, the upper end of the shaft being drawn forwards and its lower end turned backwards and outwards. Union by fibrous tissue took place; and some new bone is formed around the ends of the fractured parts.

The patient had a curved spine. In a fall, caused by her foot tripping, she fractured her humerus and the neck of her femur. The accident happened ten months before death; and the arm was kept permanently extended "on a long splint, with a crutch," for five weeks. The patient recovered considerable power in the arm: she could make all her usual *underhand* movements, but could not raise the shoulder or the upper arm.

From the Museum of John Howship, Esq.

923. A humerus which was fractured about two inches below its neck. The lower portion was drawn far upwards on the outer side of the upper one; and their adjacent surfaces are united by a large quantity of spongy osseous tissue. New

bone has also been formed around both the fractured extremities.

From the Museum of Robert Liston, Esq.

924. Part of a humerus fractured near its tubercles. Necrosis appears to have followed the fracture; and the dead portion of bone is surrounded with a layer of new bone.

925. The acromion process of a scapula and upper part of a right humerus much shattered by a gunshot-injury. The acromion has been separated at its neck from the rest of the scapula, and the articular surface for the clavicle is also broken away. The head of the humerus is uninjured, but separated, at the anatomical neck, from the shaft, the upper part of which is broken into many fragments.

From a British soldier, wounded at the siege of Sebastopol, 1855. Excision of the head of the humerus was commenced; but, in the course of the operation, it was found necessary to perform amputation at the shoulder-joint.

Presented by Dr. R. Lyons.

926. The upper end of a right humerus which was fractured by a gunshot. The shaft immediately below the neck is split longitudinally in many pieces, some of which are driven into the cancellous structure. Most of the lines of fracture terminate above the junction of the shaft with the ununited epiphysis; one, however, on the posterior surface runs nearly to the centre of the articular surface.

From a British soldier, wounded at the siege of Sebastopol, 1855. This portion of bone was excised.

Presented by J. R. Taylor, Esq.

927. A left humerus which was fractured in two or more directions about the junction of the upper and middle thirds of its shaft. Firm reunion has taken place, with very little distortion but with a considerable increase in the size of the shaft.

928. A right humerus fractured obliquely through the middle of its shaft. The lower portion has been drawn upwards

and backwards, but firm reunion has been effected by intermediate new bone. *Hunterian.*

929. A left humerus fractured rather obliquely through the middle of the shaft. The parts are united firmly, but with some lateral displacement. A large portion, which was displaced from the posterior part of the shaft, is now firmly fixed like a bridge passing from one part of the shaft to the other. *Hunterian.*

930. A right humerus fractured transversely through the junction of the middle and lower thirds of its shaft. The portions are united firmly; but the lower lies almost entirely in front of the upper portion. The parts of the medullary tube, which were thus exposed at the end of each portion, are closed with bone; but slight depressions indicate their former situation. The extremities of the portions are smoothly rounded; but a small osseous spine projects from the margin of each. *Hunterian.*

931. A right humerus, the shaft of which was broken in two places about the junction of its middle and lower thirds. The portions are united firmly and evenly, but with a considerable displacement of the lowest portion, which is fixed anteriorly and externally to the axis of the shaft. A smooth depression exists where the medullary tube of this lowest portion is covered in with a thin plate of bone.

Hunterian.

932. The lower end of a humerus with a comminuted fracture. One line of fracture extends from the trochlea nearly vertically up the shaft, detaching the external condyle and the adjacent part of the shaft; another extends transversely, detaching the internal condyle. The lower end of the radius and ulna are preserved, No. 956.

From a young sailor who fell from the mast-head to the deck of a ship.

Presented by George Busk, Esq., 1869.

933. The bones of an elbow-joint. There has been a comminuted and very irregular fracture of the articular extremity of the humerus, the portions of which are firmly united by bone but much displaced, the inner condyle being carried inwards and upwards, the outer condyle backwards and upwards. The ulna is united by bone to the trochlea of the humerus, and is directed forwards nearly at a right angle to the shaft; the radius can be freely rotated.

From the Museum of Sir A. P. Cooper.

934. The bones of an elbow-joint. There has been a transverse fracture of the humerus immediately above the condyles and in part within the joint. The lower fragment is drawn forwards and inwards, and its broken surface is firmly united by bone to the anterior border and surface of the upper fragment. Its articular surface therefore looks straight forwards; but there appears to have been free motion between it and the radius and ulna.

From the Museum of Sir A. P. Cooper.

935. The bones of an elbow-joint with a large mass of bone in the position of the external condyle, which appears to have been broken off and to have reunited in an abnormal position. The articular surface for the radius is turned upwards and forwards, and some new bone has formed around it.

From a female Dissection-subject, 1867.

936. The bones of an elbow-joint, exhibiting injuries inflicted by a chaff-cutting machine. The head and upper third of the radius are cleanly divided in a direction nearly parallel with the axis of the limb; the anterior portion of the trochlear surface of the humerus and the coronoid process of the ulna are also cleanly severed, evidently by a blow passing in the same direction as that which divided the radius, and which was probably inflicted by the knife of the machine. (See MS. Notes, vol. i. p. 89.)

Presented by John Hilton, Esq., 1866.

937. The humerus of a Hare, which was fractured near the middle of its shaft. The portions overlap each other considerably and are not united, though a large quantity of new bone is formed upon their adjacent surfaces.

Hunterian.

938. The humerus of a Turkey fractured in two or more directions near the middle of its shaft. The portions are united firmly, but with such displacement that they form nearly a right angle with each other. *Hunterian.*

939. The humerus of a Fowl fractured about the middle of its shaft. The parts are much displaced, but are united by an intermediate broad piece of bone. *Hunterian.*

940. The humerus of an Eagle fractured in two places near the middle of its shaft. The two lower portions are united with much displacement, the lowest of them having been turned half round; the upper portions are not united, but the broken end of the medullary tube is closed and new bone is formed around its surface. *Hunterian.*

Other Fractures of the Humerus:—734 to 736, 747–8, 759, 769, 775–6, 786, 789, 806, 813 to 815, 817, 819, 821 to 823, 825 to 827, 836 to 838, 1119.

Fractures of the Radius, Ulna, and Bones of the Hand, arranged according to situation from above downwards.

941. The bones and ligaments of an elbow-joint. Fracture through the base of the olecranon occurred long before death. The portions are not united; but their broken surfaces and edges are smooth, and covered-in by a layer of compact tissue. There does not appear to have been any ligamentous tissue between them.

From the Museum of R. B. Walker, Esq.

942. The bones and other parts of an elbow-joint. The olecranon was transversely fractured. The portions are half an inch apart, and are connected by a band of dense fibrous tissue

attached to the posterior margin of the lower and the anterior margin of the upper portion.

The joint had recovered perfect mobility.

From the Museum of John Howship, Esq.

943. A radius and ulna, with part of the humerus. The olecranon has been doubly fractured, and its portions are not united. The cartilage was completely removed from the articular surface of the ulna, and the corresponding surfaces of the humerus and radius ; but on the summit of the head of the radius, and the tuberosity of the humerus, there was comparatively little change. At all the parts where the bone was exposed its tissue is light and spongy.

The patient was a middle-aged man, who received a compound fracture of the olecranon in a fall. The injury was followed by acute inflammation of the joint, on account of which amputation was performed.

From the Museum of Robert Liston, Esq.

944. The bones of an elbow-joint. The olecranon was fractured a month before amputation was performed ; and its portions are not united. The cartilage has been removed from the whole articular surface of the ulna ; the subjacent bone is superficially ulcerated, and new bone is deposited upon the outer wall of the upper part of the shaft of the ulna. There is slight ulceration around the margin of the head of the radius, and upon a small part of the articular surface of the humerus. Just above the internal condyle a long thin layer of the wall of the humerus is in a state of necrosis, and was in process of separation by ulceration of the surrounding part.

The patient was a middle-aged woman, who received a compound fracture of the olecranon from a blow. Acute inflammation ensued ; abscesses formed within and around the joint ; and amputation was performed a month after the accident.

From the Museum of Robert Liston, Esq.

945. The bones of an elbow-joint. The olecranon was fractured at its base. No union has taken place ; but part of the

detached portion suffered necrosis, and is partially separated. The articular surfaces of all the bones are superficially ulcerated; and new bone is abundantly deposited upon them in the neighbourhood of the joint.

946. The upper part of an ulna in which there is extensive ulceration of the articular surfaces, especially in the lesser sigmoid cavity. A fracture, passing vertically downwards from the joint through the base of the olecranon, is firmly united by interposed bone. *Hunterian.*

947. The bones of an upper extremity, arranged by Mr. Hunter to illustrate his Lecture on Fractures of the Olecranon. The top of the olecranon has been sawn-off and fastened with a strip of leather to the back of the humerus. A portion of caoutchouc was also fixed in it and in the piece of olecranon which was left connected with the shaft of the ulna; and both pieces are furnished with rivets and a hook, so that they may be closely adapted. The design appears to have been to show how, when the forearm is fixed, the two portions of a fractured olecranon are drawn apart; and how, when a ligamentous union is formed between two such portions, it, like the piece of caoutchouc which represents it, may be longer or shorter according to the position in which the arm is maintained during its formation. *Hunterian.*

948. A left radius fractured rather obliquely at the middle of its shaft. The portions are united, with a slight displacement. *Hunterian.*

949. A right radius similarly fractured, but in which the apposition of the portions was less exact, the lower portion having passed upwards in front of the upper portion. *Hunterian.*

950. An ulna which has been fractured rather above the middle of the shaft and firmly united, with a large formation of new bone around the seat of injury. The bone appears to be more dense than usual.

Presented by Gilbert W. Mackmurdo, Esq., 1867.

951. A radius and ulna, of which the latter was broken through the middle of its shaft, and the former appears to have been fractured or to have received some injury about its head. The portions of the ulna are united, but with great enlargement around the seat of fracture and slight distortion. The enlargement has proceeded so far that the edge of part of the ulna has come nearly into contact with that of the radius, and a kind of joint is formed between them. The head of the radius is almost entirely removed; a remaining portion of its margin has formed a new joint with the side of the ulna below the lesser sigmoid cavity. The larger articular surface of the ulna is much increased in width; and new bone, such as is formed in rheumatic affections, is accumulated upon its margins.

From the Museum of Joshua Brookes, Esq.

952. A radius and ulna, with part of the humerus. The radius and ulna were fractured transversely at the upper parts of their shafts. The portions of the radius, much displaced, are united by one process of bone extending between their extremities, and by another passing like a buttress nearly two inches long from the end of the upper to the posterior part of the lower portion. The fractured portions of the ulna are not united; but their extremities are enlarged by the formation of bone around them, and are smooth on the surfaces which moved upon each other. The point of the olecranon was broken off and united by ligament. The coronoid process of the ulna was also fractured, but is firmly united by bone, more of which is deposited on the articular surface. The heads of the radius and ulna and the condyles of the humerus are enlarged and rendered irregular by formation of new bone around them. Their articular surfaces also are rough; and a canal extends through the base of the olecranon to the outer surface of the bone, by which fluid was probably discharged from the joint. On the front of the external condyle is a hard polished surface, on which, after the removal of the articular cartilage, the head of the radius moved.

From the Museum of Robert Liston, Esq.

953. A left ulna with an ununited fracture through the middle of its shaft. The portions are displaced so as to form an angle directed inwards. A section through them shows that the medullary tube is, in each, closed with a thick plate of bone at its end, and that the end of the wall of each portion is surrounded by a ring of hard new bone which has completely coalesced with it. But no union has taken place between the masses of new osseous matter formed on each portion, although they are in close contact.

Hunterian.

954. The bones of a forearm, with the carpus and metacarpus. The radius has been fractured about three fourths of an inch from its carpal end. The portions are united firmly and smoothly; but the lower portion has been driven backwards and towards the radial side of the upper portion. The radius is shortened half an inch; and, the ulna retaining its natural length, the carpus and hand are in consequence inclined to the radial side, and the ulna appears unnaturally prominent. There is an appearance, also, as if the styloid process of the ulna had been broken off and reunited in its natural position. *Hunterian.*

955. The lower end of a radius and ulna. The former has been fractured about an inch from the lower end, and is firmly repaired. The triangular fibro-cartilage was entire. A part of the styloid process of the ulna is broken off and turned inwards.

Presented by Richard Partridge, Esq., 1867.

956. The lower end of the radius and ulna. The former has an oblique fracture; the latter is deeply fissured, without much displacement of the fragments, through its articular head. A considerable amount of repair has gone on; and the lower end of the radius is very irregular from the resulting callus. The humerus of this patient is No. 932.

From a young man who fell from the mast-head to the deck of a ship.

Presented by George Busk, Esq., 1869.

956 A. A radius and ulna with the carpal bones. Both the long bones are unusually slender; and the radius is relatively much shorter than the ulna. The lower articular extremity of the radius is widened; the articular surface is directed somewhat forwards; and upon the palmar surface is a prominent "lip," caused by the abrupt inclination forwards of the lower extremity of the bone. Near the posterior margin of the articular surface is a ridge with a prominent central spine, nearly corresponding to the concavity on the palmar surface of the shaft. The articular facet for the lower end of the ulna is only faintly indicated; the articular facet of the head of the radius is very limited; and the tubercle of the radius is so far rotated outwards that it is directed upwards. A longitudinal section of the radius shows no interruption of the continuity of the medullary canal nor of the compact wall, even at the lower extremity. The ulna, except in the adaptation of its articular facets to the shortened radius, presents no unusual feature. The carpal bones were displaced slightly forwards, being in apposition with the anterior portion of the articular surface of the radius; and, in consequence of the shortening of the radius, the ulna rested on the inner side of the cuneiform bone, and its styloid process projected considerably.

The specimen was removed from a woman, aged 25 years, who stated that when five years old she had "her wrist put out by a fall on the hand." Her right forearm was less developed in all respects than the left, and the bones were much shorter; the right wrist-joint was considerably deformed; and the hand was inclined to the radial side. It was conjectured that this condition of the bones was the result of an injury to the lower epiphysis of the radius in early life. (See Trans. Path. Soc. vol. xvii. p. 223.)

Presented by Jonathan Hutchinson, Esq., 1882.

957. Section of a metacarpal bone in which there had been a compound fracture. The portions are widely displaced, but are united by a soft substance. *Hunterian.*

958. The other section of the same metacarpal bone. *Hunterian.*

Other specimens of Fractures of the Bones of the Forearm and Hand: 764, 768, 777, 800–1, 804, 820, 1834.

Fractures of the Pelvis.

959. The pelvis of a Rabbit from which, in an experiment for determining whether, after fracture of the pelvis, loose portions of bone should be removed, the symphysis pubis being divided, "a portion of the right os pubis, about one twelfth of an inch broad, was removed in the direction of the symphysis. The edges of the wound in the skin were brought together by one uninterrupted suture. The animal appeared to recover very well; but its hind legs were ever after much separated. It was killed thirteen months after the injury, when the divided portions of bone were found separated from each other fully three quarters of an inch, and the space was filled up only by a strong membrane."

Presented by Joseph Swan, Esq.

The experiment is described by Mr. Swan in a paper, "On Injuries of the Pelvis," in the 'Medico-Chirurgical Transactions,' vol. xii. p. 523 (London, 1823).

960. Portions of a right os pubis, which perished and were separated after fracture through the middle of its body. They comprise nearly the whole extent of the bone from the symphysis to the acetabulum.

The patient was a girl five years old. The fracture was produced by the fore wheel of a loaded narrow-wheeled waggon passing, as she lay on her back, between her legs and obliquely outwards over the right side of the pelvis. She recovered from the accident without any severe symptoms. Nearly four months afterwards one of the portions of bone was discharged through a small ulcerated opening in the groin; and the other portion passed through the same opening a few weeks later. The patient's recovery was complete three years after the accident; she did not become lame; but there was no appearance of reproduction of the bone.

Presented by G. Harrold, Esq.

961. The anterior half of a pelvis, with the bladder and adjacent parts. A fracture has extended through the right os pubis, about an inch from the symphysis, and another through the middle of the ramus of the ischium; and the intervening

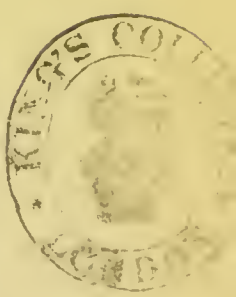
part of the obturator ligament is irregularly torn. The sharp extremity of the fractured os pubis has penetrated the anterior wall of the bladder about half an inch above the orifice of the urethra.

The injury was produced by a heavy waggon passing over the pelvis of a lad twelve years old. He had passed neither urine nor fæces for sixty hours after the accident, when he was admitted into the Edinburgh Royal Infirmary in a state of collapse and with a painful swelling of the abdomen. Very little urine was withdrawn by the catheter, and he died on the third day. A large quantity of urine was found effused in the cellular tissue of the pelvis.

The case is recorded in the 'London Medical Gazette, vol. vii. p. 29, October 2, 1830.

From the Museum of Robert Liston, Esq.

962. The anterior part of a pelvis, with the bladder, penis and rectum. The arch of the ossa pubis (which is turned forwards and downwards) has been broken, a fracture extending through the body of the right os pubis, and through the descending ramus of the left. There is a rent, nearly two inches long, in the anterior part of the bladder, and the urethra is torn completely across at the junction of its membranous and prostatic portions.



The patient was a man 24 years old, over whose pelvis a heavy waggon passed. Four hours after the injury, it being evident that urine was effused among the injured parts, an incision was made on the right side of the perineum and bloody urine escaped. The patient, who before the operation appeared to be dying, soon after became better. He lived three days, the urine passing freely by the wound in the perineum.

After death it was found that, in addition to the fracture by which the arch of the ossa pubis was separated, several other portions of both those bones and of the ischium were broken off. The right sacro-iliac symphysis was separated; the right acetabulum was penetrated by the fracture, and contained pus. Blood and urine had escaped to the lower part of the thigh, being especially effused about the sciatic nerve; but no sloughing had taken place in any of the injured parts.

The case is further related by Mr. Swan in his paper, "On Injuries of the Pelvis," in the 'Medico-Chirurgical Transactions,' vol. xii. p. 526 (London, 1823).

Presented by Joseph Swan, Esq.

963. A left os innominatum fractured in two lines, from the crest of the ilium to the margin of the acetabulum, thence across the acetabulum obliquely forwards through the outer part of the body of the os pubis, and in a line passing downwards, from the centre of the acetabulum, through the upper part of the ischium as far as its spine. The fractured portions appear to have been but little displaced; and they are firmly and closely united, with a great accumulation of bone upon their margins. The union is least perfect in the acetabulum, where, in the two lines of fracture just described, there still remain three gaps and some appearance of ulceration. The articular cartilage of the acetabulum, though cracked across in three lines, appears to have undergone no further change.

The patient, 20 years old, fell from a height of thirty feet on his left trochanter. Crepitus was felt near the acetabulum; the left foot was everted; rotation of the thigh inwards was very painful; but the limb was not shortened. In St. Bartholomew's Hospital he was placed on the double-inclined plane; a broad strap was put round the pelvis, and his feet and left thigh were so fixed as to prevent eversion. He had for a time retention of urine, and, subsequently, acute bronchitis or pneumonia. He left the hospital seven months after the accident, able to walk nearly as well as before; but he died in the following year with a return of his pulmonary disease.

From the Museum of John Howship, Esq.

964. A pelvis, the right side of which has been extensively fractured. The ilium appears to have been split through its posterior part into two layers, which are separated nearly half an inch, leaving a space now filled with new bone. The line of fracture is covered with a ridge of cancellous new bone. The os pubis was detached from its junction with the acetabulum and vertically fractured at the situation of its spine. Complete union has taken place, but with tilting upwards and inwards, so that the os pubis projects far into the cavity of the pelvis. The ischium also was broken from its junction with the ilium and through its ramus. Like the os pubis, it has been displaced upwards and inwards, projecting into the cavity of the pelvis and the floor of the acetabulum. Extensive lines of fracture also passed across the acetabu-

lum ; a large portion of its floor is wanting, and was closed with ligamentous tissue. The new bone with which these fractures have been repaired is everywhere light, rough, and cancellous, with many sharp spicula projecting from it. The whole right side of the pelvis is tilted upwards.

From a man, aged 61, who fell from a height on some stones. He recovered from the effects of the fall and was able to limp about with the aid of a stick, the right leg appearing to be shortened. He died of typhus fever four months after the accident.

The case is recorded in the 'British and American Journal of the Medical Sciences,' Sept. 1849, and in Ranking's Abstract, vol. x. p. 171.

Presented by Dr. G. Duncan Gibb, 1868.

965. The pelvis of a Deer, in which the ossa pubis and the left ischium were fractured in several directions. Their portions are firmly re-united, with considerable accumulation of bone and but little distortion. *Hunterian.*

966. The greater part of an ilium through which, in the battle of Waterloo, a musket-shot passed obliquely. The shot, misshapen and corroded, lies in the track of the wound near its inner end. There are marks of inflammation of the bone around the shot ; the margins of the channel formed by it are hard and smoothly rounded.

From the Museum of Robert Liston, Esq.

967. The greater part of a right ilium with a gunshot-fracture. The outer surface of the whole of the posterior border of the bone is broken away, leaving the cancellous tissue exposed ; and a fracture passes from rather above the middle of this border, forwards and upwards, to beyond the middle of the crest. This fracture does not extend in all parts completely through the bone, being twice interrupted by a continuity of the inner table ; but on the outer side (from which, evidently, the violence causing it proceeded) it is complete.

From a British soldier, wounded in the trenches before Sebastopol, August 17th, 1855. He was struck on the right side of the lumbar region by a fragment of shell, which tore away his pouch, exploding the ammunition in it, and broke his bayonet into several

pieces. There was a flesh wound, one inch and a half in length, a little to the right of the spinous processes of the lower lumbar vertebræ, and the parts around were extremely contused. Profuse suppuration set-in from the wound; on the 27th paraplegia came on; he then sank into a typhoid condition and died on the 2nd of September. On post-mortem examination, the muscles in the lumbar region, on both sides of the spine, were found to be black and softened as if gangrenous. On the right side the psoas and iliacus were in the same condition, and a large quantity of sanious pus was lodged in the ischio-rectal fossa, as well as in the lower part of the spinal canal. The sacro-iliac synchondrosis was almost completely separated, and the space between the bones was filled with pus. The viscera, as far as examined, were healthy.

Presented by J. R. Philip, M.B., and J. R. Taylor, Esq.

968. The lower part of a sacrum which has been perforated by a musket-ball. The track of the ball is marked by a circular canal, commencing on the posterior surface, a little to the right of the third posterior sacral foramen, and passing forwards, inwards, and slightly upwards to the body of the third sacral vertebra. Necrosis of the cancellous tissue has taken place, and new bone has been formed upon the anterior surface of the bone.

From a seaman who was shot whilst stooping in boarding a vessel. After receiving the injury, he lay for more than five hours in the bottom of the boat. Upon returning to his own ship, he was able with assistance to go up its side. Afterwards violent inflammation of the parts surrounding the seat of injury took place, and great prostration of strength, followed in a fortnight by a thin, offensive discharge from the wound, coloured, as if mixed with fæcal matter. In about five months the ball was voided by the rectum; the pain abated and he appeared to gain strength. After the fourteenth month the stools passed by the wound in the sacrum; and, daily becoming weaker, he died in the nineteenth month. Whilst in the hospital, he frequently got up and sat by the fire, having perfect use of the lower extremities, though the fæces and urine generally came away involuntarily.

Presented by Sir Stephen L. Hammick.

Ununited Fractures of the Neck of the Femur.

969. The upper part of a femur, with the acetabulum. The neck of the femur was fractured vertically close to its junction

with the head, three weeks before death; but the broken portions are held together by the fibrous investment of the neck, the posterior and inferior part of which was not completely torn through. The ligamentum teres is very small.

From a woman 76 years old. The day after the injury, which was caused by a fall on the right trochanter, the limb appeared to be shortened an inch and a half and the foot was everted. The case is described by Mr. Howship in a paper entitled "Cases of Fracture of the Neck of the Femur," in the 'Medico-Chirurgical Transactions,' vol. xix. p. 1 (London, 1835).

From the Museum of John Howship, Esq.

970. The upper part of a femur fractured through the junction of the head with the neck. The greater part of the neck is absorbed. The posterior part of its fibrous investment is entire, and the fractured surfaces are nearly in apposition; but there is no appearance of a process of union.

From a woman about 60 years old. The fracture occurred six months before death.

Presented by Joseph Swan, Esq.

971. The upper part of a femur, the neck of which was fractured within the capsule shortly before death. The fibrous investment of the neck is torn on the anterior part alone; its upper, lower, and posterior parts are entire and hold the fragments close. *Presented by Edward Stanley, Esq.*

972. The upper part of a right femur, with the acetabulum. The capsule of the hip-joint is laid open, showing a vertical fracture of the neck of the femur, close to the margin of the articular cartilage. The osseous tissue is light and friable; and the neck of the bone is shortened.

From a woman, aged 70, who died from exhaustion fourteen days after the fall which caused the fracture. No crepitus was felt; but the limb was shortened and the foot everted. The patient could raise her limb after the injury. (See Trans. Path. Soc. vol. xviii. p. 219.)

Presented by T. Carr Jackson, Esq., 1869.

973. The bones and other parts of a hip-joint. The neck of the femur was fractured in a vertical plane, probably a few days before death. The capsule is thickened; and its anterior portion, which has been turned forwards, is lined with lymph. The bones appear to have undergone no change.

Presented by Sir William Blizard.

974. The upper part of the right femur of a woman, 74 years old, of which the neck was fractured within the capsule of the hip-joint six years before death. The neck of the femur has been completely absorbed, and the upper margin of the head is three quarters of an inch below the top of the great trochanter. The surfaces of the base of the head and of the cancellous tissue between the trochanters are hardened and adapted to each other: they were held together, with a limited capacity of motion, by the thickened and closely contracted capsule. New bone has been formed about the trochanters and in abundance upon the intertrochanteric lines.

From the Museum of Sir A. P. Cooper.

975. The upper part of a femur, of which the neck was fractured vertically through its junction with the head nearly six weeks before death. A large quantity of new bone has been formed upon the trochanters; but there is no union of the fracture. Numerous portions of bone lie loose in the bottle, which were formed in the soft tissues around the fracture and separated in maceration.

The patient was a woman upwards of 70 years old. After the accident the motions of the limb were carefully restrained.

From the Museum of Robert Liston, Esq.

976. The upper part of a femur, with the acetabulum. There has been a fracture through the base of the head; and the whole of the neck has been absorbed. The fractured surfaces are smooth and covered with ligamentous tissue and nodules of a substance having the appearance of cartilage with numerous loosely hanging shreds and slender pedunculated growths attached to it. A part of the lower margin

of the head of the femur is adherent to the adjacent portion of the capsule. The shaft was drawn upwards, so that the fractured surfaces were widely separated; and the base of the neck rested upon the dorsum of the ilium, above the margin of the acetabulum. The capsule is much thickened; and its whole internal surface is beset with growths like those already mentioned, but larger. The articular cartilage is uneven, as if partially absorbed.

From a man 82 years old. The fracture occurred in a fall nearly three years before death. He was confined to his bed, with the limb extended, for twelve months. It was shortened four inches; but he was at last able to walk easily with a high-heeled shoe and a stick.

From the Museum of George Langstaff, Esq.

Fibrous Union of Fractures of the Neck of the Femur.

977. A right hip-joint seen in section. A fracture extends obliquely through the neck of the femur close to the head. The neck is much shortened; and the head rests on the lesser trochanter and the adjacent part of the remaining portion of the neck. The material of the union of the fracture is fibrous and very imperfect.

From a man aged 50, who received the injury in a fall down a chimney when eight years old. The limb became much wasted; and nearly all power of movement in the joint was lost.

Presented by Dr. T. Stretch Dowse, 1876.

978. The upper part of a femur, with the acetabulum. The neck of the femur was fractured through its junction with the head twenty-two months before death; and the portions are widely apart, the shaft being drawn upwards. The greater part of the neck has been absorbed: that which remains is surrounded with irregular growths of bone; and its fractured surface is covered with ligamentous tissue and prominent nodules of a substance like cartilage. The head is not altered in form; but part of its articular cartilage is absorbed; its fractured surface is smooth, and has some nodules of cartilaginous substance attached to it; its upper

margin is attached by a broad band of ligament (the remains perhaps of its fibrous investment) to the remaining portion of the neck. The capsular ligament is thickened; and numerous lobulated processes of fibrous tissue project from it into the cavity of the joint.

The patient, a woman 79 years old, fell on the right trochanter. On the same day the foot was found slightly everted. The limb was not then shortened; but it afterwards gradually became three inches shorter than the other. The case is related by Mr. Howship in the 'Medico-Chirurgical Transactions,' vol. xix. p. 8.

From the Museum of John Howship, Esq.

979. The right side of the pelvis with the right femur of a Peccary. A fracture passes through the neck of the femur; and its head is firmly fixed in the acetabulum though not united to it. A false joint has formed between the fragments; and their smooth opposed surfaces are partially covered with a fibrous membrane. The head of the femur is supported by a concave bony projection from the shaft. The capsule of the false joint was formed by fibrous tissue. *Purchased*, 1873.

980. The upper part of a femur the neck of which was fractured very near the head six years before death. The greater part of the neck has been absorbed; but the fractured portions are closely apposed. There is an elevation of bone between the trochanters, apparently the remains of the neck, which has a nearly smooth, hard and rounded surface, and which fitted in a concavity formed in the fractured surface of the head of the femur like a shallow ball-and-socket-joint. The lower and posterior margins of the fractured surface of the head are closely united by ligament to the adjacent portion of the capsule, and to the opposite fractured surface of the base of the neck; so that at one part of the fracture a false joint has formed, and at another there is union by ligament. A large quantity of new bone has been formed upon the trochanters and about the inter-trochanteric lines. The capsular ligament is thickened; and on its outer surface large and thick portions of new bone have been formed. The intimate union of the capsule with the lower and pos-

terior margins of the fractured bone, and the general aspect of the parts, make it very probable that in this case, as in some of the specimens already described, the fibrous investment of the posterior and lower part of the neck of the femur was not torn across.

The patient was a man 82 years old. He was confined to his bed for eighteen months, at the end of which he could only walk with crutches. The utility of the limb, however, gradually increased; and long before his death he used to walk about without any assistance and with but slight lameness.

From the Museum of George Langstaff, Esq.

981. The upper part of a femur with part of the os innominatum. The neck of the femur was fractured near its junction with the shaft, but within the capsular ligament, fourteen years before death. The fractured surfaces are smooth; and each of them is covered with a tough fibrous tissue, mixed with nodules of a substance resembling cartilage, so that they may have moved freely upon each other. The neck of the femur is not absorbed: the greater part of the articular cartilage is removed; the head of the bone is reduced in size and firmly fixed to the acetabulum and the adjacent part of the capsule. The capsular ligament is thickened; and there are many prominent fasciculi of fibrous tissue upon its internal surface. On the outer surface of its upper part is a bursa, which was interposed between the summit of the great trochanter and the upper margin of the acetabulum.

The patient, a woman 62 years old, fell and struck her left hip upon stones. She was at once entirely helpless; but there seemed at first no shortening of the limb, and the injury was treated as a bruise. In three months she was able to walk without assistance. For fourteen years afterwards she followed an active and laborious occupation without discomfort: the left leg was two inches shorter than the right; but she never felt either pain or weakness. The motions at the hip were ample and free; and there was a slight eversion of the foot. The case is related by Mr. Howship, in the paper already referred to, p. 138.

[It will be observed that, in this case, a large portion of the neck of the femur, remaining connected with the head, is not absorbed: in other preparations also (Nos. 983, 985, 985A, &c.), though in a less striking manner, the same fact is shown; so that

it appears to be a general rule that that part of the neck of the femur which, after intracapsular fracture, remains connected with the head, is not absorbed, as that part is which is connected with the shaft.]

From the Museum of John Howship, Esq.

982. A hip-joint, from a woman 75 years old, in whom the neck of the femur was fractured within the capsule ten years before death. The whole of the neck has been absorbed: the remaining surfaces of the base of the head, and the cancellous tissue between the trochanters (now set wide apart), are smooth and covered with layers of ligamentous tissue, long narrow bands of which also pass from one to the other, and from both of them to the adjacent parts of the capsule. *From the Museum of Sir A. P. Cooper.*

983. Section of the upper part of a femur and of the acetabulum. There has been a fracture directly through the neck of the femur near its junction with the head. All that portion of the neck which intervened between the plane of fracture and the shaft has been absorbed; and the head, unaltered in its form and structure, is attached to the shaft by an incomplete layer of ligamentous tissue. *Hunterian.*

984. The other section of the same femur, showing, more distinctly than the preceding specimen, a thickening and contraction of the capsular ligament. *Hunterian.*

985. Section of the upper part of a femur, the neck of which was fractured many years before death. The fracture extends in a vertical plane from the upper and outer margin of the head of the femur to the lower and outer part of the neck. That part of the neck which remained in connexion with the trochanters has been absorbed; that part which was connected with the head is indurated but not otherwise altered. The fractured surfaces have become hard and smooth, and are held near together by bands of tough ligamentous tissue interposed between them. A large quantity of new bone has been formed upon the intertrochanteric lines; and a part of it projects in a strong ridge, like a

prop, beneath that portion of the neck of the femur which remains in connexion with the head. The capsular ligament is shortened, thickened, and indurated. The articular cartilage has been partially absorbed.

From the Museum of George Langstaff, Esq.

985 A. The other section of the same femur.

The patient was a man 65 years old, who received the fracture in a fall from a gig. The symptoms of the injury were obscure. He was confined to his bed for nearly twelve months, at the end of which he was able to walk with crutches. His limb was considerably shortened; but it became gradually more useful, and for some time before his death, which was caused by disease of the urinary organs, he could walk with sticks.

The case, with others belonging to similar preparations from Mr. Langstaff's Museum, is further related in Mr. Langstaff's "Cases of Fractured Neck of the Thigh-Bone within the Capsular Ligament," in the 'Medico-Chirurgical Transactions,' vol. xiii. p. 494 (London, 1827); and in his 'Catalogue of Preparations,' p. 33 &c. (London, 1842). There is also an engraving of the specimen in Sir A. P. Cooper's 'Observations on Fractures of the Neck of the Thigh-Bone,' pl. xi. fig. 1 (London, 1823: 4to).

From the Museum of George Langstaff, Esq.

985 B. The upper part of a femur in which a fracture of the neck, within the capsule, occurred sixteen months before death. The fracture extended through the junction of the head and neck. The whole of the neck has been absorbed; and the fractured surfaces are smooth and covered by ligamentous tissue. At the posterior and lower part strong bands of ligament, about half an inch in length, extend from one fractured surface to the other, and from both, but especially from the base of the head, to the adjacent portion of the capsule. The capsule itself is shortened and thickened.

The patient was a woman 55 years old. The nature of the injury was not detected; and rest alone was employed. The limb was shortened an inch and a half.

From the Museum of George Langstaff, Esq.

986. Section of the upper part of a femur which was fractured through the junction of the head with the neck five months

before death. The whole of the neck has been absorbed; and the head is united to the cancellous tissue between the two trochanters by a thin continuous layer of compact fibrous tissue. The structure of the head is unaltered; but there is scarcely a trace of the attachment of the ligamentum teres.

From the Museum of John Howship, Esq.

987. The acetabulum from the same patient as the preceding femur. The capsule of the joint is thickened; and nothing remains of the ligamentum teres but a few shreds attached to the bottom of the acetabulum.

The patient was a woman 66 years old. She fell on the right hip. Directly after the fracture the limb was shortened two inches and a half and the foot was everted. She was confined on a double inclined plane for a fortnight, but afterwards was not restrained. She died twenty-one weeks after the accident, gradually exhausted. The case is related by Mr. Howship in the paper already referred to, p. 138.

From the Museum of John Howship, Esq.

987 A. The upper part of a femur, of which the head has been separated by an intracapsular fracture, and remains ununited except by a band of fibrous tissue attached to its posterior margin. The neck has been completely absorbed, and the cup-shaped surface of the head moved over a smooth facet on the upper part of the shaft.

Accompanying Dr. Alexander's Jacksonian Prize Essay, 1882.

987 B. The head and upper third of the shaft of a femur with an intracapsular fracture, which is united by ligamentous material. A cup-shaped projection of new bone, which is much more extensive on the posterior surface, springs from the margins of the distal fragment.

Accompanying Dr. Alexander's Jacksonian Prize Essay, 1882.

987 C. The pelvis and femora of a Puma which had been lame for years, with much shortening of the right lower extremity. The right acetabulum is shallow, and its lip is rounded and irregular; lying within it is a small concavo-convex portion

of bone, the smooth convex surface of which fitted into the acetabulum, while its outer rough surface was connected by a band of ligamentous tissue to the rough posterior surface of the upper extremity of the femur. Just below this surface on the outer side of the shaft is a prominent outgrowth of bone, which has no relation to any normal structure, the neck having completely disappeared. The femur is shortened by about three quarters of an inch. Its inferior articular surface is irregular, with lipping of the edges.

These changes may have resulted from the separation of the epiphysis of the head or from fracture of the neck by an injury some years before the death of the animal. (See Trans. Path. Soc. vol. xxxiii.)

Presented by T. B. Sutton, Esq., 1882.

Bony Union, real or supposed, of Fractures of the Neck of the Femur.

988. Transverse sections of the upper part of a left femur, the neck of which was fractured vertically close to the head and entirely within the capsule. The periosteum around the fracture is slightly thickened. The head retains its natural level in relation to the trochanter. The broken posterior margin of the neck is driven for a short distance into the cancellous tissue of the head; and its anterior margin projects a little forwards; but the parts have suffered no other displacement. The fracture has been so nearly repaired that the eye can barely discern its line, except at one situation, in which a very thin layer of tough ligamentous tissue intervenes between the broken surfaces. The two portions are immovably united by bone posteriorly; but in the anterior and upper part the union appears to be by ligament, and the portions are movable to a very slight extent.

The patient was a lady more than 80 years old. The limb was not shortened, but was slightly everted. Death occurred five weeks after the injury.

The case is related by Mr. Swan in his 'Essay on Tetanus, founded on Cases and Experiments,' p. 15 (8vo, London, 1825).

Presented by Joseph Swan, Esq.

989. Sections of the upper part of a right femur, in which fracture through the neck is believed to have occurred eleven years before death and to have been partly united by bone. The greater part of the neck is absorbed ; and the head is half an inch below the level of the great trochanter. The walls of the head, neck, and shaft are continuous; but between the cancellous tissue of the head and that of the neck and shaft there is a vacant space, about a line broad, which was filled with a cartilaginous substance. One margin of this space is formed by a layer of compact osseous tissue, continued straight upwards from the wall of the shaft across the junction of the neck with the head to the upper margin of the latter ; the other margin of the space is formed by the unaltered cancellous tissue of the head. The walls of the shaft of the bone are thin.

The patient was a woman 50 years old. Immediately after a fall she had shortening of the right leg and eversion of the foot. She was confined to her bed nearly twelve months, and for ten years afterwards walked with crutches. After death the right limb was two inches and a half shorter than the left.

The capsule of the hip-joint was found very much thickened ; and the articular cartilages of the femur and acetabulum were partially absorbed. The bone was boiled for many hours, and all the cartilaginous matter was dissolved which during life had filled the now vacant spaces. The case is described by Mr. Langstaff in the 'Medico-Chirurgical Transactions,' vol. xiii. p. 499 (London, 1835).

From the Museum of George Langstaff, Esq.

990. Transverse sections of the upper part of a left femur, in which are some appearances as if the anterior part of the base of the neck had been fractured and the posterior wall had been bent forwards, or partly driven into the cancellous tissue between the trochanters. The anterior part of the neck forms a prominent angle, at which there is an appearance of a fissure, with new bone formed round it and the supposed line of fracture ; the posterior wall is very short, and deeply incurved, but its compact tissue is perfect and continuous ; the head is on a level with the trochanter, and its cartilage has been thinned and in part removed.

From the Museum of Sir A. P. Cooper.

991. A femur, from a woman 24 years old, which was fractured through the base of the neck and the great trochanter. The portions are united smoothly and with but little formation of bone. The neck appears to have been driven down between the trochanters: its axis is now nearly at a right angle with that of the shaft; and the head is below the level of the great trochanter.

This and the four following specimens are described by J. B. Hodgson, Esq., in the Guy's Hospital Reports, 2nd series, vol. vii. p. 272.

992. The upper portion of the right femur of a woman, 90 years of age, fractured through the neck fifteen weeks before death. The plane of fracture extends vertically through the neck, the upper border being close to the margin of the head. At the lower part the inferior fragment is impacted to the extent of a quarter of an inch within the upper; here bony union has taken place. The neck is shortened, probably in the changes of old age.

Mrs. N., aged 90, in September 1841 had a fall on the hip; the limb was immediately disabled, everted and shortened. She was placed in bed, with the limb extended over a double-inclined plane formed of pillows. Bed-sores formed; she sank, and died four months after the injury.

993. The upper portion of the left femur of a woman, 81 years of age, fractured through the middle of the neck three years before her death. Firm bony union has taken place; but the neck is so much shortened, either by impaction or absorption or both, and the shaft is so much rotated outwards, that scarcely any interval exists between the posterior intertrochanteric line and the border of the articular surface of the head. The superior margin of the lower fragment forms a prominent ridge in front, about an inch above the intertrochanteric line.

Ellen R., age 78, in July 1847 fell on her hip, was unable to rise, and on examination was found to present the usual signs of fracture of the cervix femoris. She was kept five months in bed. In a year she was able to walk, but the limb was shortened and everted. She died in July 1850, with malignant ulcer of the opposite thigh, from which she was suffering at the time of her fall.

994. The upper part of the left femur of a woman, 75 years of age, fractured through the neck eight years before death. Complete bony union has taken place; the neck is shortened and somewhat thickened. The lower fragment, which includes both the trochanters, is rotated outwards; so that the posterior upper angle of the great trochanter is but a quarter of an inch from the articular surface of the head. A projecting ridge marks the line of the fracture on the anterior surface of the neck; but any irregularity that may have existed on the inner side has been obliterated by time and the perfect manner of the union.

Sarah S., aged 67, in November 1841 was knocked down and fell on her hip. The limb was disabled, shortened three quarters of an inch, and much everted. It was easily reduced to its proper length and position, and was maintained for fourteen weeks upon a double inclined plane made of pillows sewed together. After six months she was able to walk without crutches, and there was no observable shortening. She died in October 1849.

995. The upper part of the right femur of a woman, 74 years of age, which appears to have been fractured through the neck some time before death and to have completely reunited. The neck is much shortened, and the head approximated more closely than usual to the posterior intertrochanteric line. A strongly marked ridge, crossing the middle of the neck in front, indicates the line of fracture in this situation. The bone is thin, soft, and very greasy in texture on the posterior part of the head and neck, so that it may be indented by slight pressure.

The following account of this specimen is extracted from Mr. J. B. Hodgson's manuscript:—

"Mrs. Rebecca M., aged 64, on the 21st January 1842 slipped down in her pattens, fell on her hip, and was unable to rise; the foot was everted, the limb shortened, &c. She was kept on the double-inclined plane of pillows four months. At the end of five months was able to walk with crutches. The foot was everted, but the limb was not distinguishably shorter than the other.

"August 1843, examined this woman again; and she can walk well for her age; the leg is not perceptibly shortened; but the foot is everted.

"*Post-mortem Examination*, January 1852.—The right leg everted and shortened. On taking out the femur, fracture was found within the capsule; the head sunk, from absorption of the

neck, into the intertrochanteric space, so that the top of the head is one eighth of an inch below the level of the top of the trochanter; the same rotation of the head backwards exists as in all the cases: the line of fracture is also, as in the others, smooth and depressed behind, projecting and rough in front; the space between the lower margin of the head and the little trochanter is about three fourths of an inch, in the healthy limb it is one and a half inch: between the posterior margin of the head and the great trochanter half an inch, in the sound limb one inch. The anterior and inferior third of the head, which from its altered position no longer bore upon the acetabulum, had suffered absorption of its cartilage, but had become covered by a smooth, fibrous investment, continuous above with the round ligament. The left cervix is in a normal condition and position, and shows no absorption of the neck, or altered position of the head: and both bones are tough and healthy for the age."

The five preceding specimens were presented by Mrs. Hodgson, 1854.

996. A section through the right hip-joint of a child about ten years of age. The head of the femur appears as an irregular piece of cartilage, much eroded and very imperfectly ossified. It is continuous with the neck, which is bony and separated from the shaft by a distinct interval filled with lymph. The cavity of the acetabulum is also filled with soft lymph, in parts where the cartilaginous head of the femur does not come into immediate contact with it. These appearances, in Mr. Hilton's opinion, denoted old fracture through the base of the neck of the femur, followed by chronic inflammation of the joint.

The patient, when five years old, struck her foot so violently against a block of wood as to be thrown down in a sitting posture. She complained at once of pain in her hip. She is said to have been "better" on the next day; but three weeks later she began to limp. Shortly before her death, she walked on crutches, wearing a high-heeled boot. The right lower extremity was shortened to the extent of an inch and a half.

Presented by John Hilton, Esq., 1864.

The three following preparations are placed here for the purpose of illustrating some of those appearances which have been regarded as produced by the repair of intracapsular fractures of the neck of the femur. There is no sufficient evidence that fracture had occurred in any of these cases: no line of fracture can be traced; there is no interruption of the continuity of either the cancellous or the compact tissue: and the appearances are not dissimilar

to those observed in many cases, the results of injury without fracture, or of disease independent of injury. [See the specimens in the Series of Diseases of the Joints, Nos. 1763, 1765 A, 1766.]

997. Section of the upper part of a femur, which was supposed to have been fractured across the neck, and to have been united by bone. The neck is very short ; the upper margin of the head is about a quarter of an inch below the level of the great trochanter ; and there is a considerable deposit of new bone around the junction of the neck with the shaft. Both the walls and the cancellous tissue of the head are continuous with those of the neck and shaft.

998. The other section of the same femur.

The preparation is described and figured in an "Account of a Case" &c., by Robert Liston, Esq., in the 'Edinburgh Medical and Surgical Journal,' vol. xvi. p. 214 (Edinburgh, 1820).

Presented, with the preceding, by Robert Liston, Esq.

999. Sections of the upper part of the left femur of a child, five years old, in which it was supposed that the neck had been fractured by a fall in infancy. The head is small, oval, and flattened on its articular surface ; and its upper margin is a quarter of an inch below the level of the great trochanter. The neck is very short ; but its walls and cancellous tissue are continued with those of the head and shaft.

Presented by Henry Earle, Esq.

1000. The upper part of a right femur, which has been fractured through the base of the neck and through the great trochanter. The neck is thus considerably shortened. The neck appears to have been impacted in the upper part of the shaft ; and the union is complete, but with such lowering of the head that its margin touches the lesser trochanter.

Presented by G. W. Mackmurdo, Esq., 1867.

1001. Section of the upper part of a femur in which there has been a comminuted fracture. The neck has been fractured obliquely through its junction with the shaft, just within the attachment of the capsule ; another fracture has passed across the upper part of the shaft, just below the great tro-

chanter, and another, apparently in a vertical direction, through the great trochanter. The neck has been thrust into the cancellous tissue between the trochanters. It has undergone no change of form or structure, and is firmly fixed at a right angle to the axis of the shaft, with a very thin layer of compact fibrous tissue intervening between its fractured surface and that of the cancellous tissue between the trochanters. On the exterior of the neck, opposite the line of fracture, there is a small accumulation of bone. The lower wall of the neck is supported by the lesser trochanter, on which it rests, a thin layer of fibrous tissue intervening between them. The fractures through the upper part of the shaft and the trochanters are completely united, and with but little displacement. A large quantity of bone, some of which forms pointed prominences, is deposited around the trochanter minor, and in a line following the direction of the fracture from that process to the base of the trochanter major.

1002. The other section of the same femur. A portion of the capsule of the joint is here left, and is considerably thickened.

Presented, with the preceding, by Henry Earle, Esq.

Fracture of the Neck of the Femur external to the Capsule.

1003. Section of the upper part of a femur in which a fracture extended obliquely through the base of the neck, in a plane between the trochanters. The neck is not altered in size or form ; it has been forced downwards and outwards into the cancellous tissue between the trochanters, and has there become firmly united ; a broad line of ligamentous tissue, with which some bone appears to be combined, marks, on the surface of the section, the bond of union. A large quantity of bone has been formed on the lesser trochanter, and forms a prominent ridge, on which the lower surface of the neck of the femur is supported.

From a man 65 years old. Twenty years before death he fell from the maintop of a ship to the deck. He remained eighteen

months in an hospital, and upon his discharge was able to walk with a stick. The foot was inverted, and the limb shortened one inch.

From the Museum of George Langstaff, Esq.

1004. The upper part of a femur, with a portion of the os innominatum including the acetabulum. A fracture of the neck, external to the capsule of the hip-joint, extends from immediately above the lesser trochanter, through the base of the greater, which is completely separated from the neck. The ligamentum teres is uninjured.

From a woman aged 77, who met with the injury through slipping on the floor when attempting to rise from her chair. After fracture the limb was somewhat shortened and the foot everted. She died four days after the accident. The muscles around the joint were lacerated, with great extravasation of blood.

Presented by John Hilton, Esq., 1866.

Fractures of the Shaft of the Femur, arranged as from higher to lower.

1005. Section of the upper part of a left femur, in which there has been a comminuted fracture between the trochanters and in the upper part of the shaft. The fragments are firmly re-united but with remarkable displacement. The shaft, which was obliquely fractured, has been drawn upwards; and the sharp point of its broken end projects nearly an inch above the upper margin of the head: it has also been rotated outwards, so that the linea aspera looks straight inwards. The head and neck, with the great trochanter entire and with several fragments united to them, are all firmly united by bone to the posterior and inner wall of the shaft, in such a position that that which was the vertical axis of the trochanter is directed straight forwards while the axis of the shaft is at right angles with it; and the foot must have been turned straight outwards. New bone has been abundantly formed about many of the lines of fracture.

From the Museum of Sir A. P. Cooper.

1006. The upper part of the right femur of a man, 75 years of age, fractured in two places and firmly united by bone.

The upper fracture passes obliquely across the neck, from the upper and back part to the anterior intertrochanteric line, at which part the lower edge of the upper fragment makes a considerable projection downwards and forwards. Owing to the oblique position of the fragments, the space between the head of the bone and the great trochanter is much diminished. In the section, a line of more compact bone across the cancellous structure indicates the situation of this fracture. On the superior and anterior surface of the neck is a considerable deposit of new bone. The lower fracture extends obliquely through the upper third of the shaft, commencing on the outside, two inches below the great trochanter, and passing downwards and inwards about four inches. There is considerable displacement, the end of the lower fragment being within half an inch of the trochanter.

Joseph B., aged 73, on the 6th of May 1848 tripped and fell; he immediately felt pain in his hip, and found that the leg was powerless. It was shortened and everted, and presented the general symptoms indicating fracture of the cervix femoris. After remaining six weeks in bed, he attempted to get up, and in doing so fell and struck his hip, and felt something break: this was probably the lower fracture. The limb was ultimately shortened three inches, and he was never able to bear his weight upon it. He died July 1850.

1007. The upper end of a left femur. A fracture passes across the neck, through the anterior intertrochanteric ridge and down the shaft. There is also a comminuted fracture of the upper portion of the great trochanter. The neck is impacted in the trochanters; and owing to eversion of the shaft there is a deep cleft along the anterior intertrochanteric ridge. Firm bony union has taken place.

From a lady aged 84. Three years before her death she fell and fractured the femur; at the end of four months she was able to walk without a stick, but frequently suffered from pain in the injured hip. Ultimately receiving a fresh injury in the same part from a fall, she was again laid up, was never able to move the left lower extremity, and died of bronchitis six weeks after the second accident.

Presented by Edward Cock, Esq., 1868.

1008. The upper part of a right femur, of which the neck was fractured through the plane of its junction with the upper part of the shaft. The great trochanter appears also to have been split down, its posterior part being pushed backwards ; probably the neck of the femur was driven in between the fragments. The parts are all very firmly united, with a large accumulation of bone about the trochanters. The neck of the femur is not altered in size or shape ; but it is horizontal and its upper margin is below the upper part of the great trochanter.

1009. The upper part of a left femur fractured at the junction of its neck with the upper part of its shaft. The posterior fractured margin of the neck has been driven further in between the trochanters than the anterior margin has. It is possible, indeed, that the posterior part of the base of the neck was alone broken, and that its anterior wall was bent or cracked without displacement ; for there is no trace of fracture on the anterior surface, though the head is turned far backwards and its lower margin is within five lines of the trochanter minor. There is a great accumulation of bone about the trochanters; and a large part of the trochanter major appears to have been broken off and firmly reunited.

1010. The upper part of a right femur which was fractured through the base of the neck, external to the capsule of the hip-joint, and through the base of the trochanter major. The fragments are firmly reunited by bone ; but the shaft is drawn upwards and forwards, and rotated outwards, so that the unbroken portion of the trochanter is half an inch behind and above the head of the femur, and the linea aspera looks straight inwards. The shaft is also at a right angle with the neck, and appears to have been in a state of permanent and extreme flexion.

From the Museum of Sir A. P. Cooper.

1011. The upper part of a right femur which has been fractured through the trochanters. The shaft has been drawn up-

wards and rotated outwards, and is now united at an acute angle with the neck, the great trochanter being considerably above the level of the head. The fracture appears to have been comminuted; but the consolidation is so complete that its exact seat is not readily defined. The articular surface of the head is roughened by formations of new bone.

From the Museum of Sir A. P. Cooper.

1012. The upper part of a right femur. A line of fracture can be traced running vertically downwards for three inches from the middle of the outer surface of the great trochanter to the upper part of the shaft; the line of fracture here makes a wide curve forwards, and then runs upwards along the front of the shaft to the anterior intertrochanteric line, whence it can be indistinctly traced to the top of the great trochanter. The lower part of this fragment overlaps the shaft below it, and is itself overlapped at the anterior intertrochanteric line by the lower and anterior part of the neck of the femur, which has been fractured close to the trochanters and impacted into those processes. This impaction produced not only the fracture above described, but also the separation of an inch of the compact tissue of the shaft in front of the lesser trochanter, and the splitting of the posterior part of the great trochanter, including a wedge-shaped piece of the outer side of the shaft below it. This last fracture has united with but little displacement; the others, though firmly joined to the rest of the bone, remain greatly displaced from their normal relations. The bone is remarkably strong and heavy.

1013. The upper part of a femur, fractured through its neck and through the trochanters, between which the neck appears to have been driven. There is eversion of the shaft, shown by the cleft along the anterior intertrochanteric ridge which lies in the line of fracture of the neck. The fragments are fastened in the position they occupied at the patient's death.

From a woman aged 74. She was knocked down, and survived the injury for twenty-four days.

Presented by John Adams, Esq., 1868.

1014. A left femur which was fractured through its upper part. The plane of fracture passed obliquely backwards, outwards, and downwards, through the anterior part of the base of the neck, below the lesser trochanter and through the posterior half of the great trochanter. The portions are united firmly, though not closely, and with some eversion of the limb. There is a great accumulation of bone about the lesser trochanter and the posterior intertrochanteric line.

From the Museum of Robert Liston, Esq.

1015. A right femur which was fractured in two or more directions just below the trochanters. The parts are all firmly united, but with such distortion that the axis of the neck is directed downwards and inwards, forming an angle of about 60° with the axis of the shaft. The texture of the whole bone is light, and very greasy.

From the Museum of Robert Liston, Esq.

1016. A left femur fractured through its shaft, just below the lesser trochanter. Its portions are united smoothly and firmly, but with some shortening and a prominent angle in front. The shape of the head and neck is altered, as by chronic rheumatic arthritis. *Hunterian.*

1017. The upper half of a left femur which has been broken obliquely through the upper part of the shaft. The plane of fracture is parallel with, and two inches below, the intertrochanteric line. A longitudinal fissure extends from this down the outer side of the shaft for two inches and a half, where it meets another slight transverse fissure.

Probably caused by a gunshot injury, as the specimen was received from the Crimea during the war with Russia, 1855.

1018. The upper portion of a right femur, exhibiting an oblique fracture passing through the great trochanter, downwards and inwards, to an inch and a half below the lesser tro-

chanter. The whole of the great trochanter and a portion of the shaft below it are broken away.

From a British soldier, wounded at the siege of Sebastopol, 1855.

1019. The upper half of a right femur, which has received a gun-shot fracture, probably from a fragment of shell. The larger portion of the great trochanter and the adjoining part of the neck of the bone are broken-away; and a very oblique fracture extends through the shaft, the plane of which passes from immediately below the anterior surface of the great trochanter, downwards and backwards, to the middle of the linea aspera. The head is uninjured.

From a British soldier, killed at the siege of Sebastopol, September 8, 1855.

Presented by J. R. Taylor, Esq., D. I.-G.

1020. The upper end of a left femur with an oblique fracture extending from the middle of the posterior surface of the neck, downwards and forwards, to the anterior surface of the shaft, four inches below the top of the great trochanter. The upper fragment includes the head, the greater part of the neck, the great trochanter, and a part of the shaft below this prominence. The posterior margin of the great trochanter, to the extent of an inch and a half in length, has been broken away, leaving the cancellous tissue of its interior exposed.

From a private in the 68th Regiment, aged 23, struck on the left hip by a fragment of shell at the siege of Sebastopol, 1855. The wound, nearly an inch in length, extended down to the bone, which was distinctly felt to be fractured. As the joint was supposed to be injured, excision of the upper end of the femur was performed. The patient was discharged on pension nine months after, and had a tolerably useful limb.

Presented by J. C. O'Leary, Esq.

1021. The upper fragment of a fractured right femur. The plane of the fracture commences above at the outer side of the great trochanter, and extends downwards and inwards to

two inches below the lesser trochanter Nearly the whole of the great trochanter is broken away ; but the head and neck of the bone are uninjured.

The wound was probably caused by a fragment of shell. The specimen was received from the Baltic during the war with Russia, 1854.

1022. Sections of the upper part of a femur fractured obliquely below the lesser trochanter. The portions are united firmly ; but the upper one is drawn upwards and outwards, so that they form an obtuse angle. Bone is accumulated in small quantity around them at the situation of the union ; and, internally, the medullary tube is interrupted by a thin partition of compact bone which lies in the plane of fracture.

Presented by Sir William Blizard.

1023. A right femur fractured at the junction of the upper and middle thirds of its shaft. The upper portion has been drawn forwards and the lower one upwards ; but they are firmly and smoothly united, with little deformity, and the medullary tube is in both closed by layers of compact bone which are continuous with the walls of the shaft above and below.

1024. A right femur which was fractured very obliquely, from the front of the great trochanter downwards and inwards. Firm reunion has been effected by new bone formed between the sides of the fragments ; but there is considerable shortening and eversion of the limb, the lower part of the shaft having been drawn forwards and upwards, and turned so far outwards that the back of the condyles looks directly inwards. *From the Museum of Robert Liston, Esq.*

1025. A left femur which was fractured transversely just below the junction of the upper and middle thirds of the shaft. The lower end of the upper portion was drawn forwards, and the upper end of the lower portion was drawn inwards, so that the fractured ends lay across each other, forming an angle of about 140°, and with a distance of from one to two

inches between them ; but they are united firmly by two strong intermediate bridge-like masses of bone.

From the Museum of Robert Liston, Esq.

1026. A left femur, of which the middle third of the shaft was broken into several large pieces. These are all reunited very firmly, but with displacement and consequent shortening and distortion of the limb. The lower end of the uppermost portion was drawn forwards, and projects, with a sharp point and a smoothly closed medullary tube, in front of all the rest. The lower portions were drawn upwards, backwards, and inwards, and the condyles were turned outwards. *Hunterian.*

1027. A femur in which a fracture just below the middle of the shaft has been firmly united, but with much deformity from the displacement forwards of the upper fragment, and with shortening. The bond of union is formed by bone placed between the two fragments, which are separated from a quarter to half an inch. The ends of the medullary canal are closed, and the extremities of the fragments are rounded by absorption.

Presented by T. Carr Jackson, Esq., 1877.

1028. A left femur of which the shaft was fractured just above its middle. The portions were widely separated, the upper one having been drawn forwards, and the lower upwards and backwards ; but they are firmly united by a strong intermediate mass of bone. *Hunterian.*

1029. A right femur fractured in two places. The upper fracture is about three inches below the great trochanter ; here the lower fragment is displaced outwards and upwards, and the upper fragment much tilted forwards. The lower fracture is very oblique, and begins more than three inches below the upper ; the lower fragment is here also displaced outwards and drawn upwards. In neither fracture are the exposed interior parts of each fragment anywhere in con-

tact; in both there is much external callus; the exposed medullary cavity is covered-in by new bone, excepting in the upper fragment of the lower fracture.

Presented by Messrs. Eade and Caulfield, 1880.

1030. Section of a right femur which was fractured transversely at the junction of the upper and middle thirds of its shaft. The end of the upper fragment has been drawn inwards, the lower one being at the same time carried upwards and outwards and rotated, so that what was its internal surface looks straight outwards. In this position the corresponding surfaces of the shafts, overlapping each other nearly three inches, are united by an intermediate layer of bone from one half to three quarters of an inch thick, formed of cancellous tissue with a thick wall of compact substance at each end.

From the Museum of Sir A. P. Cooper.

1031. A right femur, of which the shaft was broken near the junction of the middle and lower thirds. The portions considerably overlapped each other, the lower one having passed far upwards behind the upper one; but they are united by a strong intermediate mass of bone and, though there is great shortening of the limb, there is no eversion of the condyles. *Hunterian.*

1032. A right femur, very slender and having, from rickets, an unnatural curve forwards. It was broken very obliquely through the junction of the upper and middle thirds of its shaft; its portions are united firmly by intermediate bridges of bone, but with much deformity, the lower portion having been drawn upwards in front of the upper one. The ends of the fractured portions are sharp and uneven.

Hunterian.

1033. A short and slightly rickety right femur, which was fractured near the middle of its shaft. The lower portion has been drawn behind the upper one; but they are united firmly and smoothly.

1034. A longitudinal section of the lower part of a right femur. Its shaft is fractured very obliquely through the middle third. The upper fragment is completely impacted into the lower, which is widened by the splitting of the shaft. A second fracture runs transversely an inch and a half above the condyles; and here impaction has also taken place, the posterior part of the compact wall of the upper fragment being driven into the cancellous tissue below.

From a man aged 83, who received the fracture by a fall down some steps. The injured thigh was shortened to the extent of two inches; the crepitus of the fracture above the knee was plainly felt, yet the shortening could not be diminished by extension: this was probably due to the firmness of the upper impaction. The enforced recumbency of posture after the accident caused retention of urine; and he died with cystitis and suppurating kidneys, twenty-seven days after the fall. The other half of the injured bone is in the Museum of Guy's Hospital. (See Trans. Path. Soc. vol. xxix. p. 190.)

Presented by Thomas Bryant, Esq., 1876.

1035. Section of a right femur, fractured very obliquely from before backwards and from without inwards, through the whole length of the lower third of the shaft. The portions are united by tough partially ossified substance deposited between their adjacent surfaces, but with considerable shortening, the upper portion projecting with a sharp point in front and on the inner side of the lower one.

Presented by J. G. Andrews, Esq.

1036. Part of a femur which was fractured obliquely near its condyles. The lower portion was pushed far upwards, and to the inner side of the upper one; but they are firmly united by thick irregular processes of osseous substance passing from one to the other.

Presented by Sir William Blizard.

1037. The lower half of a left femur which has been fractured obliquely through the inferior third. There is an interval of nearly an inch between the fragments, the lower one being drawn upwards and outwards. Union has taken place

through the medium of a considerable mass of sponge-like bone. *Presented by Sir Stephen L. Hammick.*

1038. The right femur of a Sheep, which was fractured near the middle of its shaft. Its portions are reunited, with much shortening and a great accumulation of bone behind them.

Hunterian.

1039. The lower portion of the right femur of a gentleman upwards of 70 years of age, fractured nine years before death. The plane of fracture extends obliquely from the posterior surface of the shaft, five inches above the condyles, downwards and forwards, to immediately above the articular surface. There is great displacement, the lower fragment being drawn upwards and backwards: it is not in immediate contact with the upper, but is firmly united to it by three strong bridges of bone; it is also slightly rotated outwards.

The injury was occasioned by falling down a flight of stone steps. Both bones of the left forearm were also fractured, and several other minor injuries received. The leg was placed upon a pillow, and long straight splints applied, during a period of several months. After his recovery the patient was able to walk about on a high-heeled boot with a stick.

Presented by Benjamin Travers, Jun., Esq.

1040. Sections of the lower part of a femur which has been fractured and firmly reunited, with overlapping of the fragments, the lower being behind the upper one.

Presented by Gilbert W. Mackmurdo, Esq., 1867.

1041. The bones of a knee-joint. The epiphysis of the femur was separated by violence from the shaft, three years before amputation. The shaft was forced downwards and backwards. In this position a firm and smooth reunion has taken place, with very little shortening or distortion of the limb.

The patient was a girl, fourteen years old when her leg was caught in a wheel and the epiphysis separated. After the accident the knee remained painful and swollen, and she halted a little in walking; but nothing particular ensued for nearly three years

after her apparent recovery from the accident, when a large abscess formed in the ham and communicated with the knee-joint. For this the limb was amputated; and the patient recovered.

From the Museum of Robert Liston, Esq.

1042. A section of the lower end of a femur and of the adjacent parts, after a compound fracture. A large portion of the wall and cancellous tissue of the femur has been thrust through the tendon of the quadriceps femoris muscle, just above the patella. The knee-joint and the tissues around the protruded portion of bone appear to have been acutely inflamed; the cartilages are superficially ulcerated.

From the Museum of Sir A. P. Cooper.

1042 A. Portions of the bones of a lower extremity showing the results of a compound fracture of the lower end of the femur implicating the knee-joint. The fracture is oblique; and the lower end of the upper fragment perforates the skin over the front of the articulation: this portion of bone is sclerosed; and the medullary canal is closed by compact osseous tissue. The lower fragment of the femur is tilted backwards. No union has taken place between the fractured portions. Considerable destruction of the articular cartilages of the knee-joint has taken place; and the joint itself is partially ankylosed.

From a woman aged 40 years, who was admitted into St. Bartholomew's Hospital, Oct. 2nd, 1880, with a compound fracture of the femur extending into the knee-joint. The injury was treated in the ordinary way; but the upper fragment after a time protruded from the wound, and its end was sawn off. The wound healed, and the patient was discharged from the Hospital. In the following October she fell, and the bone again protruded. Amputation was then performed.

Presented by Anthony A. Bowlby, Esq., 1882.

1043. The lower part of a femur in which there is a fracture through the lower and posterior part of the inner condyle. The fracture is entirely within the knee-joint, and the portions are held together by the periosteum, a part only of which is torn. *Presented by Sir William Blizard.*

1043 A. The lower end of a femur which has been fractured in its lower third. A line of fracture extends from the outer surface of the shaft at the junction of the middle and lower thirds vertically downwards through the middle of the shaft, and penetrates the knee-joint between the condyles; another line of fracture, passing horizontally inwards, has separated the internal condyle from the inner half of the shaft. The knee-joint is perfectly healthy.

The specimen was taken from a man aged 51 years, who fell upon his knees while intoxicated. On his admission to the London Hospital the lower fragments, especially the outer of the two, were drawn backwards by the gastrocnemius muscle. The double inclined plane failed to rectify the displacement; and the tendo Achillis was therefore divided. No effusion into the joint followed the injury. The patient died of delirium tremens with brain symptoms thirty days after the accident. (See Trans. Path. Soc. vol. xxxiii. 1882.)

Presented by Frederick Treves, Esq., 1882.

1044. Portion of the lower end of a right femur and the upper end of the tibia, removed by operation on account of a gunshot injury to the former bone. The posterior and inner side of the articular surface of the outer condyle is broken away, leaving the cancellous tissue exposed; and a deep fissure extends upwards and outwards through the condyle but does not quite reach the outer surface of the bone. The tibia seems not to have been injured; but the articular cartilage is separated, and the surface of the bone roughened for a small space opposite to the principal point of injury to the femur.

From a private in the 77th Regiment, aged 19, who, at the siege of Sebastopol, September 8th, 1855, was wounded by a musket-ball in the left popliteal space. The case was at first treated as a flesh-wound; but, inflammation of the joint coming on, the ends of the bones were excised on the 1st of October by Mr. Lakin, Civil Surgeon attached to the Army. The bullet was found lodged in the posterior part of the joint, partially impacted in the cancellous tissue of the outer condyle of the femur. The patient did well for some time, but died, apparently of exhaustion, on the 29th of October.

Presented by J. R. Taylor, Esq., D. I.-G.

1045. The lower part of a femur which was fractured very

obliquely from above downwards and from behind forwards. The upper portion was driven more than three inches downwards in front of the lower one; and its sharp end must have penetrated the knee-joint, for it is now on a level with the condyles. An inch of this end has perished, and is surrounded by a groove. A slight degree of union has taken place by new bone formed on the adjacent surfaces. The articular surface of the condyles is superficially ulcerated.

Hunterian.

1046. The lower half of a left femur with a comminuted gunshot fracture near the junction of the middle and lower thirds. The bone has been splintered into many fragments, most of which are now united to each other and to the main fragments by nodulated and porous new bone. One of the pieces, two and a half inches long, is interposed between the ends of the principal portions, nearly at a right angle to the axis of the shaft. At various points in the extremities of the fragments necrosis has taken place; and the bone thus affected is in process of separation.

From a private (John Sheehan), aged 19, 57th Regiment, wounded in the left thigh at the siege of Sebastopol, June 18th, 1855. The wound presented two openings, an anterior and a posterior; the finger, passed through the latter, detected several fragments, which were removed, and a tolerably uniform surface was then felt. It was determined to make an attempt to save the limb, which was accordingly bound up with a long splint and promised favourably for a time. He, however, complained of much pain in the limb from time to time, gradually wasted, suffered from diarrhœa, and finally sank on the 6th of August. On examination the chief organs were found in a normal condition. There was some congestion of the ileum; and the colon presented a few points of ulceration. In the left lower extremity, beneath the integuments, all the muscular and other textures, from the seat of injury to the groin, were converted into a soft, broken-down, black, rotten mass.

Presented by Dr. R. D. Lyons.

1047. A left femur fractured in several directions through the upper part of its shaft and the base of the great trochanter. At the part where the shaft is broken no union has taken place. (The portions are artificially united.) In the other

directions, there are merely fissures of the bone with little or no displacement ; at these, also, no reparative change appears to have taken place. *Hunterian.*

1048. Part of a femur in which, after fracture through the middle of its shaft, necrosis of the ends of the fragments took place. The dead portions were in process of separation, and new bone was abundantly produced on all the parts around them ; but no union has been effected. *Hunterian.*

1049. The upper half of a left femur which received an extensive comminuted gunshot fracture, extending from the lesser trochanter obliquely downwards and outwards. Union has taken place between the principal fragments and three or four smaller detached pieces, much new bone being formed between them. The injury being rather recent, the consolidation is not very firm. The upper fragment, including the head, neck, great trochanter, and three inches of the outer side of the shaft, has united to the lower fragment in an extremely oblique position, the axes of the two forming an angle of about 130°.

From the Crimea, 1855.

Presented by J. R. Taylor, Esq., D. I.-G.

1050. Portion of a right femur, which has received a comminuted gunshot fracture rather above the middle of the shaft. The upper and lower fragments are united very obliquely to each other through the medium of a splinter six inches long, detached from the inner side of the bone. Some smaller pieces have also been separated ; but the whole has been consolidated by a considerable formation of new bone of spongy texture. The projecting ends of the principal fragments are rounded off.

From the Crimea, 1855.

Presented by J. R. Taylor, Esq., D. I.-G.

1051. A right femur which was fractured obliquely through the upper part of its shaft. The portions are not united, though

they appear to have been in exact apposition. A part of the lower portion suffered necrosis; and there has been an abundant accumulation of bone around its margins, as well as on the adjacent part of the upper portion. *Hunterian.*

1052. A right femur which was fractured obliquely below the middle of its shaft. A portion of muscle became fixed between the ends of the two fragments; but they united, though with a long and large channel passing obliquely from before backwards and from below upwards through the whole thickness of the shaft. In this channel, which is lined throughout by compact bone, the muscle, or its remains, lay when the patient died. The whole of the shaft is enlarged, and the lower articular surface is ulcerated.

Presented by the Executors of William Long, Esq.

1053. A left femur which received a gunshot fracture about the middle of the shaft. A considerable portion of the great trochanter is also broken away ; and there is a longitudinal fissure between this and the lesser trochanter, on the anterior aspect of the bone. The plane of fracture of the shaft extends from above downwards and backwards. Around both points of injury are evidences of inflammatory action, and new bone of light spongy texture has been formed ; but union of the fractured ends has not been completed.

From the Crimea, 1855.

1054. The femur of a Deer, which was fractured transversely through the middle of its shaft. The portions were displaced to a distance of more than an inch from each other, but are united by two strong lateral bridges of new bone. The ends of the medullary tube are not closed.

Other specimens of Fractures of the Femur : 669, 681, 713, 737 to 744, 749, 754 to 757, 773, 785, 787–8, 791 to 795, 798–9, 802–3, 809, 810, 816, 818, 824, 833–4, 839 to 841, 1117, 1118.

Fractures of the Patella and other Sesamoid Bones.

1055. A patella, with the adjacent parts from the front of the knee-joint, of which the blood-vessels have been injected. The patella has been fractured transversely. The portions are half an inch apart anteriorly; but posteriorly they are nearly in contact. The gap thus formed is partly filled by lymph; and a thin layer of the same substance is deposited within the joint over the line of fracture.

The patient, a woman 67 years old, fell on her knee on a projecting stone. Repair seemed making progress till, six weeks later, the patient died with apoplexy.

From the Museum of John Howship, Esq.

1056. A transversely fractured patella, of which the two portions, more than an inch apart, are united by a broad band of ligamentous substance; "which" [union, says Mr. Hunter] "I suppose has been effected by granulations, without suppuration." *—*Hunterian MS. Catalogue.*

In the lower portion of the patella there is a transverse fissure, as if it had been a second time fractured shortly before death or amputation.

1057. A patella which has been fractured transversely near its middle. The fragments are separated to a distance of two inches; and some nodular masses of bone have been developed in the ligamentous structure which connects them, close to the fractured edges.

Presented by R. R. Robinson, Esq.

1058. Section of a patella which has been fractured transversely. The fracture united by a thick layer of ligamentous tissue about half an inch in length. In both this and the preceding specimen (1057) the fragments of the patella are evidently enlarged.

From a man aged 81.

Presented by Richard Partridge, Esq., 1865.

* See quotation in vol. i. p. 28, after No. 57.

1059. Section of a patella fractured transversely ; the two fragments are united by a band of ligamentous tissue over an inch in length and nearly half an inch in thickness. As in the preceding specimen, the upper fragment is tilted backwards. *Presented by Richard Partridge, Esq.*, 1868.

1060. A similar specimen; but the bond of union is much longer and thinner. *Presented by Richard Partridge, Esq.*

1061. A similar specimen, with very long ligamentous union. *Presented by Richard Partridge, Esq.*

1062. A patella fractured transversely. Anteriorly the margins of the fracture are widely apart; but posteriorly they are nearly in contact, and the space between them is filled by a tough ligamentous tissue. The parts have been dried after the injection of their blood-vessels. *From the Museum of Joshua Brookes, Esq.*

1063. A patella fractured transversely and similarly prepared. The two portions are more than an inch apart, and are connected by a band of dense fibrous tissue attached to their posterior margins. The fractured edges are rounded-off, and the surfaces are smooth and widely separated. As in all the other specimens, the fragments are turned somewhat forwards, so that the anterior edges are further apart than the posterior. *From the same Museum.*

1064. A patella with the ligamentum patellæ and part of the quadriceps femoris muscle. The patella was fractured transversely; and its portions are nearly an inch apart, but are united by ligament attached to their anterior margins. *Hunterian.*

1065. A patella which was fractured transversely in two places. Of the three portions, the two upper are connected by a broad band of fibrous tissue two inches long, the two lower

by a similar band not more than a quarter of an inch in length. Some or all of the portions must have grown since the fracture; for, if now put together, they would form a patella much larger than any one of the natural size.

From the Museum of Robert Liston, Esq.

1066. The portions of a patella which was fractured transversely in an irregular line. They were connected by fibrous tissue, with an interval of about an inch between them. The lower portion appears to have been also fractured vertically, and to have had its two fragments completely united by bone: it is considerably enlarged.

From the same Museum.

1067. A patella fractured transversely in an irregular line through its middle. The lower portion is fractured vertically. The transverse fracture is united by fibrous tissue; the vertical one is partially united by bone.

From the same Museum.

1068. A patella from which the outer and lower margin has been obliquely broken off. The portions lie close together, but are not united.

From the Museum of Joshua Brookes, Esq.

1069. A transversely fractured patella, of which the portions are in close apposition and in part united by bone. A small piece of the inner angle of the upper portion perished and was in process of separation.

The patient, a sailor 24 years old, fell from a great height upon his knee. He was immediately confined to his bed and the limb was kept in the extended position. Seven weeks afterwards he died with hectic fever and extensive suppuration within and around the joint.

From the Museum of Robert Liston, Esq.

[The case is described in "Experiments and Observations concerning Fractures of the Patella," by George Gulliver &c., in the 'Edinburgh Medical and Surgical Journal,' vol. xlvii. p. 163 (Edinburgh, January 1837). The paper contains also an account of several experiments (the result of one of which is shown in 1072)

to prove that "Osseous union [of fractures of the patella] is simply the effect of immovable coaptation of the fragments, the provision for which, in certain forms of fracture, is the integrity of the aponeurosis in front of the bone."]

1070. The bones of a knee-joint in which the tibia is completely and smoothly ankylosed by bone to both the femur and fibula. The patella is not united to either the femur or the tibia, but is much altered in form and enlarged. Both its surfaces are marked by a deep, irregularly sunken transverse line, as if it had been fractured and united by bone.

The disease of the joint had long existed. The patient recovered after amputation.

From the Museum of Robert Liston, Esq.

1071. A patella which had been fractured transversely; the fragments are closely approximated and are united by ligamentous tissue. *Presented by John Hilton, Esq.*, 1868.

1072. The patella of a Dog which was cut through transversely without dividing the fibrous aponeurosis on its anterior surface. A complete union by bone has taken place, and the line of division is scarcely discernible.

From the Museum of Robert Liston, Esq.

1073. The right femur and tibia of a Great Speckled Diver (*Colymbus*). The preparation is placed here because it was used by Mr. Hunter in his lectures to illustrate the subject of fractures of the patella.

1074. The bones of a lower extremity, with an apparatus of springs &c. attached to the femur. These also were used by Mr. Hunter in his lectures to show how the extensor muscles adapt themselves, after a fracture of the patella has been united by a long band of ligament. (See *Hunter's Works*, vol. i. p. 512.)

1075, 1076. The bones of the fore extremities of a Horse, exhibiting fracture, on both sides, of both the sesamoid

bones developed behind the metacarpo-phalangeal articulations.

From an old fat funeral-horse. One day, after he had been grazing without his shoes, he was made to gallop along a hard road, carrying a man. He suddenly stopped and rolled over, and was found to be helplessly lame. (For a full account of the case, see Trans. Path. Soc. vol. xxviii. p. 452, 1877.)

Presented by F. Ridler, Esq., 1876.

Fractures of the Tibia and the Fibula.

1077. A left tibia and fibula. The tibia is fractured in several directions near its upper end; and two of the fractures extend through its articular surface. No process of repair has taken place. *Hunterian.*

1078. A left tibia and fibula, of which the former is obliquely fractured between three and four inches above the ankle-joint, the latter between two and three inches below the knee. A thin splinter has been broken off the back of the tibia; and a fissure extends into the ankle-joint. No process of repair appears to have commenced. *Hunterian.*

1079. A tibia, showing fracture of its shaft. The bone is splintered into several pieces, three being completely separated from the main fragments.

Presented by T. Carr Jackson, Esq., 1873.

1080. A piece of timber from the deck of a man-of-war, with a fragment of the shaft of a sailor's tibia impacted deeply and firmly in the wood. The man fell from a yard; the tibia was fractured when the limb struck the deck, and this portion was driven so tightly into the timber that it had to be sawn through in order to liberate the patient.

The accident occurred on Feb. 15th, 1864, on board H.M.S. 'Scylla.' The patient made a good recovery, and sixteen years afterwards was in good health and the injured limb was perfectly useful.

Purchased, 1880.

1080 A. A left tibia and fibula, with the bones of the tarsus and metatarsus, showing a fracture into the ankle-joint. The inner malleolus and part of the antero-external angle of the lower end of the tibia have been broken-off, and the lower end of the fibula has sustained a comminuted fracture.

There is no appearance of any reparative action. The injury was received by falling into a gravel-pit.

Presented by John Hilton, Esq., 1867.

1081. The tibia of a Horse fractured obliquely. There is no evidence of any reparative action about the fragments.

A hunter belonging to His Royal Highness the Prince of Wales, about 8 years old, received a kick on the tibia from another horse. Little notice was taken of it, and the animal was regularly exercised, though not hunted with, for a week after the accident. About the seventh day inflammation and abscess ensued; and on the tenth the periosteum by which the fragments were held together gave way and the fragments parted.

Presented by H.R.H. The Prince of Wales, 1873.

1082. A tibia and fibula fractured obliquely about an inch above the ankle-joint. Some blood is effused and coagulated between the broken surfaces. There is a small aperture in the skin, through which the upper portion of the tibia protrudes. The blood-vessels have been injected.

Hunterian.

1083. Part of a tibia with the adjacent tissues, from a case of compound fracture. Portions of the bone have been removed; and the remaining fractured ends, an inch and a half apart, project into an extensive granulating cavity, and are nearly covered with lymph and granulations.

Hunterian.

1084. Parts of a tibia and fibula fractured obliquely at the junction of the middle and lower thirds. The upper portions have been thrust downwards on the anterior and inner sides of the lower ones; and no union has taken place. The cancellous tissue of the fractured extremities is filled with lymph,

and the periosteum, a part of which is reflected from the tibia, is thickened and contains some lamellæ and osseous substance.

The patient, a man 40 years old, received a simple fracture in a fall; the tibia subsequently protruded through the skin, and it became necessary to amputate the leg.

From the Museum of Robert Liston, Esq.

1085. A tibia which was fractured transversely about the middle of its shaft. Its portions are united firmly and smoothly, but with shortening and considerable lateral displacement, the lower portion deviating outwards.

1086. Part of a tibia fractured through the middle of its shaft, and repaired smoothly and with little distortion.

Hunterian.

1087. A left tibia and fibula, of which the former was obliquely fractured between three and four inches from the ankle, the latter between two and three inches from the knee. Both fractures are firmly united with an equal degree of shortening; the lower portion of each bone has been drawn towards the other bone. *Hunterian.*

1088. A tibia and fibula which were fractured just below the middle of their shafts. Each of the lower portions has passed far to the inner side of the upper one of the same bone; but they are united firmly, and the end of the lower portion of the fibula is fixed to that of the upper portion of the tibia. *Presented by Sir William Blizard.*

1089. A right tibia and fibula fractured in nearly the same situations as those in the preceding specimen; small portions of each shaft have been detached at the seat of fracture. Firm union has taken place, but with considerable distortion and superficial formation of new bone. The lower portion of the tibia is before, that of the fibula behind, the upper portion. *Hunterian.*

1089A. The lower half of a tibia and fibula which have been fractured about four inches above the ankle, and have united with great deformity and the formation of much new bone around the seat of injury. Inflammation has extended along both bones, and new bone has formed in stalactitic ridges. The fibula was fractured in two places.

Presented by J. B. Perrin, Esq., 1869.

1090. Parts of a tibia and fibula which were fractured just below the middle of their shafts. The portions of each shaft are so placed that they form nearly a right angle with each other, the apex of the angle being turned forwards. Those of the fibula are united, with the fractured ends lying side by side; those of the tibia are not united, though they lie close together; and bone has been formed around the extremities of each.

From a case of simple fracture. *Hunterian.*

1091. Part of a tibia which was fractured near the middle of its shaft. The portions were so placed as to form an angle of about 120°, with its apex turned forwards, and are united by only a small portion of their adjacent surfaces. New bone has been formed on the surfaces of the extremities of both the portions and, especially, in the angle behind them; at the anterior part of the angle one of the bones is rather deeply ulcerated.

The fracture was probably compound. *Hunterian.*

1092. Section of a part of a tibia which was fractured near the junction of the middle and lower thirds of its shaft, and of which a splinter was broken-off from the outer border. The portions are not united; but new bone has been formed upon the outer surface of their extremities.

From a case of compound fracture. *Hunterian.*

1093. Part of the fibula of a man who had a compound fracture of both the bones of the leg. The upper portion is thrust

downwards, so that its fractured extremity is nearly an inch below that of the lower portion. Its broken surface is almost smooth, the cancellous tissue being filled by a firm substance; and it rests in a cavity formed in the muscle into which it has penetrated and lined by a smooth white membrane. *Hunterian.*

1094. Two sections of the same tibia as that described in p. 81, No. 790. They exhibit incomplete union, a small portion only of the fragments being in contact. The whole shaft appears to have been unnaturally vascular. The medullary tube, exposed by the fracture, is closed by a thick layer of new bone. *Hunterian.*

1095. A vertical section of a tibia, of which the walls are irregularly thickened by formation of bone upon their surface. These formations are very hard, and have intimately coalesced with the original wall, the outline of which is but just discernible. The medullary tube opposite to the chiefly thickened part of the wall is filled with compact bone; the lamellæ of the cancellous tissue below it are thickened, while above it they are for the most part removed, and the medullary tube is filled with fatty substance. Just above the chiefly thickened part there is a slight deviation in the direction of the shaft, which, together with an oval aperture behind, makes it probable that there was an oblique fracture which united with scarcely any displacement but was followed by long-continued inflammation of the lower part of the shaft and atrophy of the upper part.

Hunterian.

1096. A tibia after a compound fracture through the middle of its shaft. The portions are firmly united, but with lateral displacement. The new bone is abundant and heavy; there is a cavity in its interior; and its surface is rough and porous like that of new bone formed on bones inflamed. There is also a cavity between the ends of the united fragments, which probably opened externally through ulcerated integuments. *Hunterian.*

1097. A tibia and fibula. The tibia was fractured near its lower end, and a large portion of the upper fragment perished and is separated. New bone has been formed on the shaft around the necrosed portion and both above and below the fracture; but no union is accomplished. The fibula was fractured near its upper end, and is firmly united, with a superabundance of new bone around it. New bone has also been formed in a thin layer on many parts of its shaft, and in a large quantity opposite the fracture of the tibia, where the two bones were united. *Hunterian.*

1098. A tibia and fibula which were fractured about two inches above the ankle-joint. The end of the upper fragment and the greater part of the shaft above it suffered necrosis. The surface of the shaft is rough, from the removal of portions of its external layers; and the limit between the dead and living bone, at its upper part, is not clearly marked. On the lower fragment, as well as on that part of the upper one which did not perish, new bone is formed. The lower end of the upper fragment of the fibula is firmly fixed to the lower fragment of the tibia; and a considerable quantity of new bone has been formed about them. *Hunterian.*

1099. The lower end of a tibia which was fractured. Part of its broken end appears to have exfoliated; and the adjacent part is covered with new bone. *Hunterian.*

1100. A tibia and fibula which were fractured through the middle of their shafts. The upper portion of the tibia protruded through the skin and was sawn off, after which necrosis of the sawn extremity took place. The dead portion, which has exactly the same characters as those sometimes separated after amputations, has nearly exfoliated; and the adjacent surfaces are thickly covered with new bone, but no union has been effected.

1101. Portions of a fractured tibia. Parts of the ends of both portions suffered necrosis and were in process of exfoliation.

A large quantity of new bone has been formed on the surface of the adjacent parts of the shaft. *Hunterian.*

1102. A portion of the tibia of a boy, 14 years old, including the whole thickness of the shaft, and measuring five inches and a quarter in length, which was sawn off in a case of compound fracture. It has marks of necrosis and commencing exfoliation of a part of its surface.

The patient's leg was crushed by a wheel; and part of the tibia, below a fracture near its upper end, was exposed. Little was done for three weeks; then, the exposed portion being found to have suffered necrosis, and the portion above it protruding, Mr. Evans excised this piece including both those portions. In ten weeks the wounds were healed, and there remained "but little lameness, and very trifling deformity." The case is recorded in 'The Lancet,' October 14, 1837, p. 87.

Presented by Evan Edwards, Esq.

1103. Portions of a tibia. The lowest portion, which appears to be the lower end of the shaft separated from its epiphysis, protruded in a case of fracture and was sawn off. The other portions, it is probable, were afterwards exfoliated.

From the Museum of Sir A. P. Cooper.

1103 A. The lower extremities of a tibia and fibula, exhibiting the form of fracture near the ankle-joint known as Pott's fracture. A line of fracture passes through the fibula about half an inch above the base of the external malleolus; and the internal malleolus is separated from the shaft by another line of fracture passing through its base.

Presented by Frederic S. Eve, Esq., 1881.

1104. A fibula very obliquely fractured through the lower part of its shaft and united with but little displacement.

Hunterian.

1105. Part of a fibula which was transversely fractured near the middle of its shaft. The portions overlap each other an inch and a half and are half an inch apart; but they are united by a strong intermediate portion of rough and porous

new bone, and they appear to have been unnaturally vascular, even far from the seat of fracture.

1106. Portions of a fibula in which, after a compound fracture through the lower part of its shaft, necrosis of parts of both the fractured ends ensued. The dead bone is separated from the living by a shallow groove. New bone has been abundantly deposited upon both portions of the shaft.

Hunterian.

1107. The tibia of a Horse which was fractured obliquely just below the middle of its shaft. Its portions are united firmly by intermediate new bone, and with but little shortening or displacement. There is an accumulation of new bone on the posterior, but none on the anterior, part of the tibia at the seat of fracture.

1108. The tibia and fibula of a Fowl. The tibia was fractured obliquely through the middle of its shaft: its portions are united with but little displacement or accumulation of bone. The fibula opposite the fracture is enlarged and fixed to the tibia by a superficial formation of new bone. *Hunterian.*

1109. The tibia of a Fowl which was fractured almost transversely below the middle of its shaft. The portions overlap each other to a considerable extent, but are united firmly and with but little accumulation of bone. The ends of the medullary tube are closed. *Hunterian.*

1110. The middle portion of a right tibia with a comminuted gunshot fracture extending obliquely downwards and forwards. Union has taken place; and a layer of spongy new bone is formed around the seat of injury. Several necrosed portions of the extremities of the fragments were in process of separation. At the upper part, behind, is a large aperture leading into the medullary cavity of the bone; and to the margin of this opening, portions of the leaden bullet which inflicted the injury are adhering.

From a private in the 9th regiment, aged 21, who received a

perforating wound from a conical bullet through the calf of the right leg whilst on duty before Sebastopol, September 1st, 1855. The ball passed behind the tibia, fracturing the bone. The patient's health being good, an attempt was made to save the limb. Although the bones united, a profuse purulent discharge was kept up, which proved so exhausting that on the 3rd of November it was considered necessary to amputate a little below the tuberosity of the tibia. The patient recovered, with a good stump.

Presented by W. Thornton, Esq.

Other specimens of Fractures of the Tibia and Fibula: 750 to 753, 760 to 762, 771, 774, 784, 790, 796–7, 805, 807, 808, 810 to 812, 842, 1122–3, 1167.

Fractures of Bones of the Foot.

1111. The bones of a right ankle-joint which have been fractured by a musket-ball. The ball has shattered the inner malleolus and lodged between the tibia and astragalus, the latter bone being broken into four pieces.

Received from the Crimea during the war with Russia, 1855.

1112. The metatarsal bone and phalanges of a great toe united by a great accumulation of bone about their articular ends. The last phalanx appears to have been fractured; perhaps the whole toe was crushed. *Hunterian.*

1113. The metatarsal bone of a Sheep, of which a great part of both the walls and the cancellous tissue has been destroyed by ulceration or necrosis, or both, succeeding to a fracture through the middle of its shaft. The fractured portions are united, with considerable displacement. *Hunterian.*

1114. A right astragalus with a musket-ball lodged on its inner side. The ball struck the articulation between the astragalus and the lesser process of the os calcis (which appears to have been fractured, as portions of it remain attached to the preparation), and then lodged in the hollow surface of the former bone without penetrating its substance. The greater part of the surface of the bone, especially the inner and upper side, is roughened and eroded by inflammation.

From a British soldier wounded at the battle of the Alma. The ball was not extracted; inflammation of the ankle-joint set in. The leg was amputated; and the patient recovered.

Presented by J. G. Guthrie, Esq.

Other specimens of Fractures of the Bones of the Foot: 843 to 846.

Subseries 4. Inflammation of Bone and Periosteum.

With Superficial Formation of New Bone: 1115 to 1219.
Inflammation of Bone producing increased thickness of the walls, and followed by increased hardness and weight: 1220 to 1243 A.
Inflammation with Suppuration in Bone: 1244 to 1247 A.
Ulceration: 1248 to 1337.
Necrosis: 1338 to 1573.

Subdivision A. *With Superficial Formation of New Bone: Periostitis ossificans; Osteophytes* *.

Consequences of simple Periostitis connected chiefly with injury or Necrosis: 1115 to 1135, and in very many of the following specimens of Ulceration and of Necrosis.
General and symmetrical Periostitis in Lions: 1136 to 1158.
Hardening and other changes in new bone: 1160 to 1186.
Syphilitic nodes: 1176 to 1179.
New bone-formations due to arsenical poisoning: 1186 A & B.
New bone-formations in Osteo-arthritis and in allied diseases in Mammals: 1187 to 1206; and in the Subseries of Diseases of Joints, 1898 to 1919 &c.
New bone formed under ulcers: 1207 to 1209, 1534 to 1536, 1539, 1540.
Diseases of new bone: 1210 to 1212, 1217 to 1219, 1260 to 1262, 1328–9, 1415–6, 1536 to 1539.

* No attempt is made to arrange the specimens according to the seat of inflammation, whether in the periosteum, or in the superficial layers of bone, or in both at once. It may be possible to make such distinctions in favourable circumstances; but they cannot be made with certainty in the present state of these preparations. Neither is the cause of the inflammation made a general ground of arrangement; for the specimens show a remarkable similarity in the characters of the new bone in many cases in which the causes of the inflammation were very different.

1115. Section of the end of a femur a fortnight after amputation. A small portion of the extremity of the wall suffered necrosis, and is separated from the rest by a narrow groove. Above it a broad thick ring of incompletely ossified cartilage surrounds the shaft. A portion of this ring, with the periosteum over it, has been removed, to show that the subjacent surface of the bone is healthy. The end of the medullary tube is filled by a vascular substance resembling cartilage partly ossified; and a flattened mass of granulations arising from this substance extends beyond and overlaps the cut end of the bone. The description in the 'Hunterian Catalogue' was as follows:—"*f.* No. 7, is a piece of the thigh-bone of a young lad who lived about a fortnight after the thigh was amputated. The fungus at the end of the bone is seen to come from the marrow. In the marrow near the end of the stump was bony matter forming, and all round the end of the stump was an increased bony thickness; and exfoliation is just begun."

1116. The upper two thirds of a femur after amputation. As in the specimen last described, there has been necrosis of the end of the stump, a complete ring of which has perished; and new bone is formed around the end of the remaining part of the shaft. Within the ring of dead bone, and projecting beyond it, new bone has been formed with a cancellous texture and a smoothly rounded surface—a mass of granulations like that in the preceding specimen having, it may be assumed, projected from the medullary tube and been developed into bone.

From the Museum of Robert Liston, Esq.

1117. The upper part of the femur of a young person, in which necrosis followed fracture. The dead bone, comprising about an inch of the fractured end of the femur, is surrounded by a broad, shallow, ulcerated groove. A part of the shaft above this groove has a thin deposit of new bone upon its surface. The new bone, gradually rising on the surface of the healthy bone, is about half a line in thickness. It consists of short and very fine osseous fibrils and

lamellæ, which are rolled and curled so as to enclose minute cellular and tubular spaces and channels. These are closely arranged and form a dry, friable tissue, with a very finely grooved and perforated surface, and with an indistinct appearance of longitudinal *grain* derived from the direction of the chief lamellæ. The new bone is closely connected to the surface of the subjacent old bone; but it may be scraped off; and the surface of the bone thus exposed (as shown at the sides of the specimen) appears only a little roughened by the enlargement of the vascular grooves on its surface. *Hunterian.*

1118. Vertical sections of part of the femur of a young person, in which, in consequence of severe inflammation after fracture, a very thin layer of new bone has been formed on a considerable portion of the shaft. The new bone (like that in No. 1117) has a close filamentous texture, and is soft, greyish, dry, friable, and easily removed, leaving the subjacent surface smooth and clean. At a short distance above the fractured end is a broad shallow groove, indicating that the end has perished; below the groove there is no deposit of new bone. *Hunterian.*

1119. The humerus of a youth, 16 years of age, which was fractured near the middle of the shaft seven or eight months before death, and had apparently united; but in the process of maceration the two portions have become separate. The effects of inflammation are seen in the formation of a delicate layer of new bone upon the greater part of the surface of the shaft, and in largest quantity near the seat of fracture.

Presented by Sir Stephen L. Hammick.

1120. Section of the extremity of a tibia after amputation. There has been necrosis of the end of the bone. A part of the dead bone has been removed; and the rest was separated from the living bone by a broad ulcerated groove. New bone has been formed over the adjacent living portion of the shaft. The new bone appears composed, like that in No. 1117, of fine osseous fibrils and curled lamellæ, enclosing

cells and tubules and forming a dry friable texture. But part of its surface is marked by deep longitudinal grooves, similar to those in which the blood-vessels proceeding from the periosteum to the shafts of long bones lie before they enter the Haversian canals. The size, direction, and general appearance of these grooves prove that the longitudinal blood-vessels were imbedded in them, and that the new bone was formed between the vessels and the shaft, and raised them up from it. The surface of the new bone between the grooves and the borders of the grooves themselves are perforated by minute, close-set apertures, many of which open into the tubular spaces enclosed by the lamellæ of the new bone, and appear to have given passage to blood-vessels proceeeding to and from the periosteum. Parts of the surface of the shaft, exposed by the removal of the new bone, appear healthy, except that the vascular grooves are larger and deeper than in healthy bone. *Hunterian.*

1121. A thin section, either of some new bone like that in the last-described specimen, or of the wall of a bone in which the vascular grooves are enlarged. The periosteum is thickened and indurated : some of its blood-vessels are shown passing into the grooves on the surface of the bone. *Hunterian.*

1122. Portion of a tibia after fracture. The fractured end and a large piece of the exterior of the shaft above it suffered necrosis ; and their exfoliation was nearly completed. The anterior surface of the sequestrum seems to have been inflamed before the necrosis ; for its vascular canals and grooves are unusually large and numerous, and some new bone is formed on it. At a short distance from the part from which the sequestrum separated, a layer of grey, soft, dry, porous, longitudinally-grooved and nodulated new bone is formed. A part of this has been scraped-off to show its slight connection with, and the unchanged state of, the old bone. It is probable that this was a case of compound fracture, in which the protruded bone did not perish till some days after the injury. *Hunterian.*

1123. Sections of a fractured tibia in which a portion of the fractured extremity suffered necrosis. Immediately above the sequestrum the bone is superficially ulcerated; but higher up a large quantity of new bone, like that last described, is formed upon its surface. *Hunterian.*

1124. A femur of which a great portion of the shaft is covered with a thin layer of grey, brittle, friable, longitudinally grooved, and superficially nodulated new bone, which in a few situations has begun, since it was dried, to crack and separate from the surface of the shaft. The rest of the shaft is healthy, except that the grooves and apertures for its blood-vessels are larger than usual. *Hunterian.*

1125. The opposite femur of the same person, similarly diseased. The new bone has an almost exactly symmetrical arrangement on the two shafts. *Hunterian.*

1126. A tibia from the same patient. Considerable portions of the shaft are covered with a thin layer of new bone, like that on the femora, small pieces of which have scaled off and left the surface of the old bone smooth and apparently unaltered. *Hunterian.*

1127. The lower end of a tibia nearly covered with a thin layer of new bone. *Hunterian.*

1128. A femur of which the lower part of the shaft is enlarged by the superficial formation of new bone around it. The formation appears to have taken place in several distinct periods; for, at the lower part, there are many irregular deposits of nodules of finely cancellous new bone, which may be separated from that which forms a more even layer around the shaft. Higher up, the middle of the shaft is a little enlarged by a thin smooth layer which has completely coalesced with the original wall. *Hunterian.*

1129. The end of a femur after amputation. A large portion of the shaft suffered necrosis, and separated. The dead bone is nearly six inches long; it includes at its lower extremity the whole thickness of the shaft; at its upper part, only the inner layers of the wall: it is nearly surrounded by new bone. The new bone is, as in many of the preceding specimens, light, dry, grey, brittle and friable. The greater part of its surface also presents, as in them, deep longitudinal grooves and numerous perforations, apparently for the passage of blood-vessels. But in many parts the grooved texture is overlaid with deposits of new bone, in the form of nodules and thick roundly-bordered plates of various size and shape, which are attached to the ridges between the longitudinal grooves and, in many places, leave only narrow gaps and foramina for the entry of blood-vessels. In their interior these nodules and plates are composed, like the rest of the new bone, of delicate lamellæ, which form minute cells and channels like those displayed in a section of an inflated human lung. Most of the plates and nodules have their surface covered with a thin layer of compact yet finely perforated and porous bone; but in some the lung-like texture is exposed; and at the lower part of the specimen is a broad ring of bone, composed wholly of finely cellular and filamentous texture.

Presented by Sir William Blizard.

1130. The end of a femur after amputation. Several inches of the shaft have suffered necrosis, including the whole thickness of the last inch, but only the inner portion of the remainder, which is separated from, but encased in, the outer layer of the shaft. Upon the surface of this ensheathing portion of living bone much new osseous tissue of a light porous texture has been formed; it is especially abundant around the margins of two large apertures or cloacæ.

From a scrofulous girl, 14 years of age, whose thigh was amputated on account of disease in the knee-joint. After the operation, the edges of the wound did not unite, the integuments sloughed, the bone became exposed, necrosis took place, and was followed by death.

Presented by Sir Stephen L. Hammick.

1131. The upper portion of a right femur, two years after amputation of the lower third. Inflammation resulted in necrosis involving nearly the whole shaft to a length of about eight inches. The sequestrum is completely detached but remains in its place. The section which has been made displays well the texture of the new bone composing the sheath formed around the dead portion. Its inner surface is finely cancellous; the outer is covered with tuberosities, generally broad and flattened, but in some parts lamelliform. There are numerous cloacal apertures.

Presented by Sir Stephen L. Hammick.

1132. Portion of a tibia, in which necrosis, consequent on amputation, affected nearly five inches of the length and, at the extremity, the whole thickness of the shaft. The outer surface of the remaining portion of the shaft is covered by new bone, which is light, white, very delicate and fragile. It is composed, like the plates and nodules in the last specimen, of fine osseous lamellæ, curled into crooked tubes and channels, all of which, having the same general oblique direction, give to portions of it a fibrous, asbestos-like appearance. Part of its surface is nearly smooth, part is nodulated; everywhere it is finely porous and not covered by a more compact layer. Between the nodules are large apertures and gaps for the transmission of blood-vessels. *Hunterian.*

1133. The lower half of the femur of a person whose skull and many other bones were extensively affected with syphilitic disease. The greater part of the shaft is covered by new bone, deposited in all the three forms illustrated in the preceding specimens. At the margins the deposit is in a very thin and, to the naked eye, uniform smooth layer; so that in some places the bone looks as if it were only discoloured. The rest of the deposit is in a thicker layer, the thickness gradually increasing towards the centre. The surface of the greater portion of the deposit is, for the most part, deeply grooved, the grooves running longitudinally, or with a slight obliquity, and in some places coalescing. In many

places, also, the margins of the grooves are thickened, and overlaid with flattened nodules and plates of bone, some of which are of large size. At the sides of the femur may be seen peculiar deposits of new bone, laid on the surface of that which is longitudinally grooved, and presenting traces of two or three broader and larger grooves which are directed transversely to the axis of the shaft. In these grooves lay the trunks of some of the transverse arborescent vessels of the periosteum, of which every artery has an associate vein on each side of it. The texture of the new bone in this specimen is in every part denser than in any of the preceding: it is intimately united with the old shaft; and its outer surface is very hard and minutely perforated.

Hunterian.

1134. The tibia from the same limb as the specimen last described. Its lower half is surrounded by similar formations of new bone. Just above the internal malleolus is a small oval ulcer through the new bone, at the bottom of which a portion of the old shaft is in a state of necrosis. *Hunterian.*

1135. Section of the lower part of a femur, the wall of which is uniformly thickened and indurated, probably in consequence of necrosis of a portion of its cancellous tissue. Some thin irregular plates of new bone (like those laid over the grooved new bone in the preceding specimens, but larger) have been formed outside the most thickened part of the shaft. They are attached to it by only a small portion of their margins and inner surfaces; in the rest of their extent they are free, separated by a distinct though narrow interval from the surface of the shaft; they must therefore have derived nearly the whole of their nutriment from the vessels of the periosteum. *Hunterian.*

The other section is preserved in No. 1485.

1136. The left tibia of a Lion, of which a great part of the surface is covered with new bone deposited in the same forms, and with the same apparent structure, as in Nos. 1133, 1134.

The only discernible difference is, that in this specimen there is more of the nodulated, and less of the longitudinally grooved, formations than in them. *Hunterian.*

1137. The right tibia of the same Lion, similarly diseased. The osseous formations, though very irregular, are arranged in precise symmetry with those on the left tibia. *Hunterian.*

1138. A section of the right femur of the same Lion after being softened by acid. Nearly its whole surface is covered by a nodulated osseous formation. The section of the new bone shows its finely cellular or lung-like texture, its more compact outer surface, and its close connection with the surface of the old bone, although the line of boundary between them is very evident. *Hunterian.*

"From this preparation of one of the bones of the Lion, which had been injected and steeped in acid, it appears that this newly added bone was vascular, and had only lost its earth by this steeping, its form still remaining: it therefore must be as much an animal substance as the old bone."—*Hunter's Lectures on Surgery: Works*, vol. i. p. 507.

1139. The other section of the same femur.

1140. Sections of the left femur of the same Lion. Like the right femur, and with an exactly symmetrical arrrangement, a large portion of its surface is covered with new bone, the structure of which is nearly all nodulated, hard, minutely cancellous or, rather, like dried lung. The exposed part of the new bone is harder and of closer texture than that which lies more deeply; it is firmly fixed to the surface of the shaft; but the boundary between them is quite distinct. *Hunterian.*

1141. The pelvis of the same Lion. Large portions of the outer surface of each os innominatum are covered with new bone, like that formed on the femora and other bones. As on

them, also, all the formations are arranged on corresponding parts of each lateral half, with an exact symmetry. There is scarcely a point of osseous formation on one side of the bone which is not precisely represented on the other. There is a similarly symmetrical formation on the inner surface of each ischium, near the foramen ovale. *Hunterian.*

1142. The right fibula of the same Lion, similarly diseased. *Hunterian.*

1143. A patella from the same Lion, with formations of new bone along the margins of its lower half and a smaller quantity of the same on its upper border. *Hunterian.*

1144. The right os calcis from the same Lion, with new bone (like that already described) formed abundantly on nearly all its surface. *Hunterian.*

1145. The left os calcis, similarly and exactly symmetrically diseased. *Hunterian.*

1146. One of the tarsal bones of the same Lion, with some small nodulated formations of new bone on a portion of its surface. *Hunterian.*

1147. The pelvis of an old Lion who had lived long in England. Formations of grey and finely cancellous bone, exactly like those in the preceding specimens, are on several parts of its outer surface. They are quite irregular in their form and thickness, but are placed with an almost exact symmetry on the corresponding parts of the two ossa innominata. Moreover, although the outlines and situations of the several formations of new bone are too irregular for any accurate description, yet there is an almost exact resemblance between those on this pelvis and those in No. 1141. In both alike, the chief deposits are on the outer surface of the ischia; in both, these surfaces are nearly covered with similar and symmetrical new bone;

and in both, the same parts are left uncovered—namely the posterior and upper borders, the tubera, small spaces of like size and form behind the notches of the acetabula, and small spaces behind the foramina ovalia. In both pelves, also, there is scarcely any new bone formed on the outer surface of the ossa pubis, except on that part which is near the acetabulum ; and, in both, what is here formed is alike continuous with similar considerable quantities formed on the lower parts of the ilia and the upper parts of the ischia. The new bone formed on the outer surface of the ilia is in numerous detached spots and lines ; but these, though having no apparent regularity of arrangement on either pelvis, yet are arranged almost exactly alike on both, leaving, in both, the upper and anterior borders of the acetabula free, and being especially attached to prominences on which muscles had strong attachments. And, lastly, though there is but one spot on the inner surface of each side of each pelvis on which there is any new bone formed, yet this spot is the same in both, namely, on the superior and inner margin of the foramen ovale. *Hunterian.*

1148. The last two lumbar vertebræ and part of the sacrum of the same Lion. *Hunterian.*

1149. The right scapula and humerus of a Lion. Large masses of bone, of light and porous texture, have been formed about the notch of the scapula and the lesser tuberosity of the humerus. *Hunterian.*

1150. Part of the left scapula of an old and very large Lion. The acromion process is covered with thick, irregular, porous and channelled new bone, which overhangs its margins and is intimately united to its surfaces. The other parts are healthy. *Hunterian.*

1151. The left ulna of the same Lion. It is enlarged, and its surface is rendered uneven by formations of new bone, which have completely coalesced with the original wall and have become very hard, heavy, compact and smooth on their

surfaces. Nearly the whole shaft is thus covered ; and part of the new bone projects in sharp ridges. *Hunterian.*

1152. The right ulna of the same Lion, similarly and symmetrically diseased. *Hunterian.*

1153. The right femur of the same Lion similarly diseased, but to a greater extent. The new bone is more abundant ; like that on the ulnæ, it is very hard, compact, and heavy ; on the anterior part of the shaft its external surface is nearly smooth ; on the posterior part it has an irregularly laminated and knotted arrangement, and portions of it project in sharp uneven ridges. *Hunterian.*

1154. The right femur of the same Lion, similarly and symmetrically diseased. *Hunterian.*

1155. The left tibia and fibula of the same Lion similarly diseased. The interosseous ligament is ossified in nearly its whole length ; and at the lower part the masses of osseous substance formed on each of the bones have coalesced. *Hunterian.*

1156. The right tibia and fibula of the same Lion similarly diseased, and exhibiting a similar exact symmetry in the arrangement and structure of the new bone.

If these specimens be compared with Nos. 1140 to 1147, it will appear that, as in the specimens from the human body, the new bone, at first porous, vascular, brittle, friable, grey, and easily removed from the surface of the old bone, has become hard, very dense and heavy, with few traces of vascularity, yellowish, smooth on its surface, and inseparably united with the shaft beneath it. The new bone on the acromion of the scapula of this Lion has so much resemblance to that on the pelves and other bones of the other two Lions, that it is probable that all these specimens exhibit only a later stage of the same disease as is shown in an earlier state in the preceding specimens (Nos. 1140 to 1147). This probability is increased by the similarity of the arrangement of the accumulations of new bone on the corresponding bones of the different Lions. This is especially evident in a comparison of the femora.

Hunterian.

1157. Two metacarpal bones of a Lion, probably the same as that from which the preceding bones were taken. They are united by new bone formed on their dorsal surfaces and borders. *Hunterian.*

1158. The left tibia and fibula of a young Lion. They are united by new bone formed on the adjacent borders and surfaces of their lower halves. The rest of their shafts and their articular surfaces are healthy. *Hunterian.*

1159. The antler of a species of Deer, probably *Dama vulgaris*. Large nodulated growths of new bone cover the greater part of its outer surface. Their peripheral parts are spongy and vascular; but processes from the compact tissue of the antler extend into their bases. These growths were probably developed as the result of some injury to the velvet.

1160. A right tibia, nearly the whole surface of which is covered with a thin irregular formation of new bone. The formation appears to have been, at a former period, like that shown in Nos. 1133, 1134; but the part of its surface which is not longitudinally grooved has become nearly smooth, as if by the coalescing and levelling of such plates of new bone as are shown in those specimens. The texture of the new bone is harder and more compact than in them; and the apertures for vessels penetrating its surface are in many situations more minute and less numerous. Some traces may be seen, on the posterior surface, of transverse grooves in which the larger periosteal vessels lay. *Hunterian.*

1161. The left tibia of the same person similarly and symmetrically diseased. *Hunterian.*

1162. A similar specimen in which the new bone, covering nearly the whole shaft of a tibia, appears to have made still further progress in the processes of induration, intimate union with the subjacent bone, and reduction in both the number and size of the vascular apertures in its surface. It may be observed in this, as in many other specimens of similarly

diseased tibiæ, that the deposit on the inner aspect is chiefly of the longitudinally grooved form, while that on the posterior and outer aspects is more generally in plates and nodules. *Hunterian.*

1163. Section of a tibia and of part of the surrounding tissues. The inner surface of the shaft, through a length of about six inches, is covered with new bone, in a layer which gradually increases in thickness from its margins to its central part, where it is rather more than half an inch thick. The greater part of the new bone appears harder and more compact than the original wall: they are intimately united; but a boundary-line between them may be discerned, marking the unaltered outline of the wall. The new bone is also distinguished from the old by having a vertical *grain*, as if from vessels running through it perpendicularly to the axis of the shaft. The periosteum covering the new bone is slightly thickened; and the integuments over it appear to have recently healed after ulceration. *Hunterian.*

1164. The other section of the same tibia macerated and dried. It shows more plainly that the disease (which has all the appearance of an ossified venereal node) is almost confined to the anterior part of the tibia, only a small similar deposit existing on the posterior surface. The medullary tissue appears healthy. Except at the part which was, probably, situated beneath an ulcer of the integuments, the surface of the new bone is smooth, not porous, but marked by a few longitudinal grooves and large apertures for the transmission of vessels. In one situation its surface is bounded by a sharp projecting edge, is very irregular and spongy or lung-like, and appears to have been penetrated by more blood-vessels than any other part. *Hunterian.*

1165. The lower end of a femur, of which the shaft is enlarged, chiefly by the superaddition of new bone. A transverse section shows that the new bone forms a layer from two to four lines in thickness, the inner surface of which has, for the most part, intimately coalesced with the circumference

of the shaft, but may be clearly traced all round it. The structure of the new bone is more hard and compact than that of the old bone; its outer surface is very coarsely porous and rugged. The original shaft, so far as it is shown in the transverse sections, is unaltered, but is very greasy.

Hunterian.

1166. Section of a tibia with a similar large ossified venereal node on its inner aspect. The boundary between the old and new bone cannot be clearly discerned. The new bone is very hard; its surface is smooth, except at one part, where a circumscribed roughness indicates that the integument over it may have been ulcerated: it is perforated by few apertures for vessels. The medullary canal of the tibia is not encroached upon; and its outer wall is of ordinary thickness.

From the Museum of Robert Liston, Esq.

1167. Section of a tibia on which, in consequence of a large wound (the cicatrix of which is shown in the integuments), new bone has been abundantly formed in the same manner as in the three preceding specimens, but over the whole or the greater part of the circumference of the shaft. A small part of the inner wall at the seat of the wound was removed. The outline of the original wall is but just discernible, the new bone formed on its exterior having completely coalesced with it. Opposite the wound the medullary cavity is also filled by new bone which has coalesced with the inner surface of the wall. The periosteum, a portion of which is reflected, is thickened, and appears to have been firmly adherent to the new bone. *Hunterian.*

1168. A tibia, of which the middle half of the shaft is covered with new bone, which has made rather less progress in becoming hard and smooth than that in the preceding specimen has. Much of it retains the darker grey and more brittle character, and the minutely cancellous lung-like structure of more recent formations of new bone.

Hunterian.

1169. A right femur, of which a large portion of the shaft is thinly covered with new bone, most of which, like that in the preceding specimens, has become hard, heavy, and smooth. This is especially the case on the inner aspect of the femur, where also the new bone is transversely marked by three sets of triple grooves in which the large vessels of the periosteum lay. Many parts of the new bone retain the longitudinally grooved and porous or finely cancellous texture which is shown in that formed on the femora marked 1124, 1125; and what was said of the similarity of arrangement of the osseous formations on the two Lions' pelves (Nos. 1141 and 1147) is, in a great measure, true of the formations on these femora. Though following no apparent order in any case, their arrangement is very like in all: in all, the chief accumulation is on the inner aspect, the least on the outer aspect, of the shaft; in all, the popliteal surface of the femur is nearly free; and even in the outline of the morbid formations there is some resemblance. A like resemblance also may be noticed in a comparison of the new bone on the following tibiæ and fibulæ. *Hunterian.*

1170. A tibia from the same person as the femur last described. Nearly the whole shaft is enlarged and much increased in weight. Its surface is, for the most part, smooth, superficially marked by transverse grooves for blood-vessels, but perforated by few vascular apertures. The surfaces of the sections show that the enlargement is due to the superaddition of new bone, which has become as hard and compact, as little vascular, and nearly as smooth as the old wall with which it has intimately coalesced. *Hunterian.*

1171. The lower end of a humerus, of which the shaft is irregularly enlarged by hardened new bone. Its surface is grooved and perforated by canals for blood-vessels.

Hunterian.

1172. A femur, of which the upper half of the shaft is enlarged, especially on its inner aspect. There is a similar but slighter enlargement of the lower third of the shaft. The

surfaces of the thickened parts are smooth and very finely perforated; and the posterior part of the shaft bears the transverse impressions of the blood-vessels of the periosteum. The increase of weight is not proportionate to the enlargement. *Hunterian.*

1173. A femur, of which the lower third is slightly enlarged. The posterior surface is covered with a thin layer of new bone. On the outer aspect of the bone, just above the outer condyle, there is a deep round impression, as if part of the wall had been violently driven in. *Hunterian.*

1174. The lower half of a femur, considerably enlarged. The enlargement appears to be chiefly due to the external formation of a thick irregular layer of bone, which has completely coalesced with the original shaft, and has a finely perforated surface marked behind by broad transverse vascular impressions. *Hunterian.*

1175. A tibia and fibula enlarged by the formation of new bone on nearly every part of their shafts. Nearly all the new bone has become very hard and heavy; it has completely coalesced with the old bone; and a great part of its surface has become smooth. The part of the new bone which has made most progress in the process of hardening is that on the middle third of the inner surface of the tibia, on which also there is, as in all the specimens of the like kind, the largest accumulation of new bone. Here it forms a gradually elevated, uneven, and almost knotted swelling, the surface of which is very hard and perforated by few apertures for blood-vessels. It is such a swelling as is described as an ossified syphilitic node; but the same disease extends in a less degree over nearly all the tibia and fibula.

Hunterian.

1176. A tibia on which there is a genuine syphilitic node, *i. e.* a small circumscribed and gradually elevated swelling on part of the middle of the internal and external walls, formed by superaddition of new bone which has become very hard and

smooth. The adjacent surface is deeply grooved for the passage of the vessels of the bone; but, except where the node is, no new bone appears to have been formed.

1177. A tibia with a similar but larger node extending over and a little beyond the middle third of its inner and outer surfaces.

1178. A tibia exhibiting a similar formation of new bone and superficial ulceration on a node formed in the lower third of its shaft. The new bone is porous and soft.

1179. A tibia and fibula diseased like No. 1175 and the specimens following it. The surface of part of the indurated new bone has the coarsely reticular arrangement commonly seen near syphilitic ulcers of long bones; and near the middle of the inner surface of the tibia there is a small round syphilitic ulcer, penetrating deeply through the new bone and surrounded by an irregular shallow ulceration of the adjacent part. The specimen thus forms a connecting link between the preceding (in most of which the disease was, doubtless, of syphilitic origin) and many, to be presently described, in which ulceration is the most striking character of the syphilitic disease. *Hunterian.*

1180. A fibula, of which nearly the whole shaft is enlarged by the superaddition of new bone, which has become hard, compact and heavy, and is inseparably united to the surface of the shaft. The chief addition is on the part which was next to the shaft of the tibia; at this part the surface of the new bone is irregular, with thick, short, imbricated plates of various form; on its outer surface it is nearly smooth, but impressed superficially by transverse grooves for blood-vessels. *Hunterian.*

1181. A fibula, of which the middle half of the shaft is much enlarged by external deposit of new bone, which is hard and compact and presents an arrangement nearly similar to that in the preceding specimen. *Hunterian.*

1182. A fibula, of which the whole length of the shaft is similarly, but somewhat less, diseased. *Hunterian.*

1183. A fibula, of which the whole length of the shaft is covered with an irregular formation of indurated new bone. At about the middle of its posterior and inner surface there are very broad and distinct transverse smooth impressions over which blood-vessels passed. *Hunterian.*

1184. A fibula, a great portion of the shaft of which is much enlarged and covered with irregular plates of hard new bone. *Hunterian.*

1185. A fibula, curved as if from hypertrophy with elongation, and slightly enlarged by external deposits of new bone. *Hunterian.*

1186. The upper part of a skull, thickened, indurated, and having thick deposits of hard bone, with nodulated and fasciculated surfaces, on the interior of the frontal and parietal bones.

1186A. The metacarpus of a Cow. The surface of the compact tissue is abnormally porous; and from several points spring small protuberances, some circular and button-shaped, others elongated and one inch in length. Their surfaces are very irregular and porous; but, as the section shows, their more internal portions are, in parts, nearly as dense as the compact tissue of the metacarpus.

1186B. A rib of a Cow similarly but more extensively affected. The compact tissue is, externally, very porous, and the protuberances large and elevated. On the inner aspect of the rib the bone is healthy, excepting anteriorly and along the lower border.

The disease, in this and the preceding specimen, was caused by chronic arsenical poisoning. Other specimens are in the Museum of St. Bartholomew's Hospital, No. 114.

Presented by the Governors of St. Bartholomew's Hospital, 1880.

1187. An elbow-joint in which the articular cartilages have been partially removed, probably by chronic rheumatic disease (osteo-arthritis) of the joint. The surfaces of bone thus exposed are smooth, hard, and in some parts polished. Nodules of new bone, very compact and hard upon their surfaces, and partly covered by glistening fibrous tissue, form thick irregular borders around the articular margins of all the bones, especially of the humerus. The head of the radius is much altered in form and enlarged by the new bone around its margin. It is also turned backwards; and a large extent of its anterior part is flattened, and corresponds to a similar flattened surface on the front and lower part of the external condyle of the humerus, on which it must have moved a little in the bent position of the joint.

From a man 50 years old, whose opposite elbow-joint was also diseased. He died with diseased lungs after amputation of one of his legs.

From the Museum of Robert Liston, Esq.

1188. The upper part of a femur, on the head and neck of which (probably in consequence of chronic osteo-arthritis) a great accumulation of new bone has taken place. The chief formation is about the attachment of the round ligament and the base of the head, especially at its anterior part. In the former situation there is a large prominent mass of an irregular conical shape and coarsely nodulated, with a deep pit in its apex in which the round ligament was attached. In the latter situation the new bone forms a large nodulated cancellous mass, thinly covered with compact bone, measuring nearly an inch in depth and an inch and a half in breadth, and projecting over all the articular part of the neck, though fixed only to the border of the head. The part of the head of the femur which intervenes between these masses of new bone is hard, smooth and polished. A vertical section of the head shows that this hardening extends for about a quarter of an inch into its interior, but that the rest of its substance is healthy.

Presented by Sir Everard Home.

1189. A longitudinal section of the first two phalanges of a

Horse's foot united by bone formed between and around their corresponding articular extremities. The new bone between their extremities forms a nearly continuous layer of cancellous tissue like that of their shafts: the bone deposited around them is in large irregular masses, variously connected, which have a coarsely cancellous, lung-like texture, and some of which are covered by a compact layer, perforated by many apertures. *Hunterian.*

1190. The first phalanx of a Horse's foot, on one side of which a broad and thick coral-like mass of heavy cancellous bone has been formed, and has grown behind the flexor tendons till it nearly surrounded them. On the other side there is scarcely any growth of bone. The articular surfaces and other parts are healthy.

Presented by James Abernethy, Esq.

1191. The phalanges of the foot of a Horse covered with large, rough, heavy, coral-like masses of finely cancellous and porous new bone, and firmly ankylosed by the coalescence of the portions of bone deposited on each. On the anterior surfaces and sides of the bones the new bone forms masses, which are in parts upwards of an inch in depth; on the posterior surface it is much less abundant. On the anterior surface of the new bone, on the second and third phalanges, there is a nearly smooth broad groove, formed perhaps by ulceration.

From the Museum of Joshua Brookes, Esq.

1192. The metacarpal bones and first phalanx of a Horse with large, coral-like bony outgrowths.

These bones were dug up during excavations for waterworks at Walthamstow, Essex.

Purchased, 1869.

1193. The metacarpal bones and first phalanx of a Horse. Their adjacent extremities are surrounded by a large disk-shaped growth of new bone, by which moreover they are firmly ankylosed. The surface of the new bone is smoother than

in the preceding specimens, especially at the anterior part ; but it is equally porous, and its general characters are the same. The adjacent borders of the former articulation are barely discernible.

From the Museum of Joshua Brookes, Esq.

1194. The last two phalanges of a Horse's foot, with the sesamoid bone, closely united by bone, and with newly formed osseous tissue, like that in the preceding specimens, on their surfaces. The upper articular surface of the second phalanx is healthy ; but a large quantity of bone has been formed around it, and especially on the inner side of it.

From the same Museum.

1195. The phalanges of a Pony's foot, with a large quantity of new bone formed in rough and hard, finely cancellous and porous masses upon their surfaces, and especially around their articular extremities. The articulation between the first and second phalanges is healthy ; that between the second and third is obliterated by complete bony union of its surfaces ; the sesamoid bone is also fixed to it by new bone.

Hunterian.

1196. The phalanges of the foot of a Horse similarly but more extensively diseased. The formations of new bone are especially abundant at the angles of the last phalanx. Here, and at the front of their articulation, the second and third phalanges are united by the new bone ; by the side of the second phalanx is a large and deep cavity, like that of an abscess, surrounded by new bone. *Hunterian.*

1197. The last phalanx of the foot of a Horse, at the posterior angles of which, in consequence of long-continued inflammation with *greasy heels*, a large quantity of new bone has been produced. In structure the new bone resembles that in the preceding specimens. It forms two long and thick, hard, coral-like processes, directed backwards and upwards in the plane of the lower surface of the phalanx.

Hunterian.

1198. A large irregular mass of new bone from the foot of the same Horse. It has the same structure as that on the phalanx. *Hunterian.*

1199. Several phalanges of the toes, probably, of a large Bear, thickened and covered with irregular formations of hard and heavy new bone. They are for the most part nodulated, and are most abundant at the borders of the bones; the plantar surfaces of nearly all are smooth and healthy. *Hunterian.*

1200. The right scapula and humerus of a small feline animal. The borders of their articular surfaces, and other parts adjacent to the joint, are covered by thick irregular masses of light and finely cancellous new bone. The masses attached to the scapula and the humerus had, in one situation, coalesced outside the joint so as to destroy its mobility. The articular surfaces and the rest of the bones are healthy; but the head of the humerus has not its usual bearing upon the glenoid cavity. *Hunterian.*

1201. The left scapula and humerus of the same animal. New bone of light porous texture is formed upon the margins of the glenoid cavity, the acromion, and the lesser tuberosity of the humerus. And the formations of bone in this specimen, though smaller than those on the corresponding bones of the right side, are arranged in similar spots, and have the same general form; those on the opposite sides of the joint have not coalesced, though they have nearly met. *Hunterian.*

1202. A patella, on the anterior surface of which new bone has been deposited, in the form of a broad thin plate, striated as if composed of longitudinal fasciculi some of which pass beyond its lower margin. *Hunterian.*

1203. The patella of some mammal similarly, but more extensively, diseased. The new bone forms a thick mass, two inches long and half an inch wide, the ends of which are prolonged in numerous sharp parallel spines. *Hunterian.*

1204. Two of the tarsal bones of a Lion (probably of the same as No. 1152), on the surface of which new bone has been abundantly formed, in irregular plates, more than two inches long, and sharply pointed backwards in the direction of the axis of the tarsus. *Hunterian.*

1205. One of the caudal vertebræ of the same Lion, with similar laminated, but not pointed, formations of new bone. *Hunterian.*

1206. Four dorsal vertebræ, the bodies of which are united by a thin plate of bone extending over the middle and right side of their anterior surfaces. The plate of bone has in some parts a fasciculated appearance ; but its surface generally is smooth. Opposite the intervertebral spaces the new bone is accumulated in round masses like exostoses. There is no distortion of the spine. *Hunterian.*

1207. A tibia, the shaft of which is unnaturally flattened, both before and behind, the outer surface measuring at the broadest part only three quarters of an inch. On the lower third of the shaft, over which there was, probably, a large ulcer of the integuments, is a broad, sharply circumscribed and elevated oval formation of new bone, with a rough porous surface and with borders projecting from half to three quarters of an inch beyond the outer and inner margins of the tibia. In several other places thinner formations of new bone have taken place.

Presented by Sir William Blizard.

1208. Parts of a tibia and fibula, both of which are enlarged, increased in density, and completely covered and united by plates of hard new bone. On the inner aspect of the tibia is an elevated flat surface, over which there was probably a large ulcer of the integuments. This elevation is upwards of five inches in length and three in breadth ; it presents an abrupt, somewhat overhanging margin and a coarsely porous surface, like those shown in the preceding preparation.

Presented by Sir William Blizard.

1209. Part of a tibia, of which numerous portions of the wall suffered necrosis. New bone has been formed on nearly every part of the shaft, partially enclosing the sequestra, the chief of which lie in cavities on the anterior part of the tibia. The greater part of the new bone has the ordinary form of flat nodules and plates, laid over a longitudinally grooved surface, imbricated, and in many parts united. But at the apertures or cloacæ, through which the sequestra are seen, the new bone presents a peculiar structure. At some it forms small compact plates, with irregularly crenated edges, the points of which radiate from the margins, and are directed towards the centres of the apertures, covering the sequestra. But for some distance round one large aperture, over which probably there was an inflamed ulcer of the integuments, the surface of the new bone is formed of minute curled and wrinkled osseous lamellæ, which being closely set, perpendicular to the axis of the shaft, and nodulated at their summits, give it a coarsely fibrous appearance. *Hunterian.*

1210. A tibia, on which, after necrosis of many small portions of the shaft, an abundant formation of new bone covered all its surface and nearly concealed the sequestra. The greater part of the new bone has the ordinary nodular and laminated form ; but near the spine of the tibia is a deeper layer longitudinally grooved. Just above the ankle, on the anterior part, an oval portion of the new bone, together with a thin scale of the surface of the shaft, having suffered necrosis, was in process of separation ; and (as is usual in such cases) there has been extensive ulceration of the new bone around the sequestrum. *Hunterian.*

1211. Part of a tibia, in which there has been necrosis of a narrow portion of the anterior wall about six inches long. The sequestrum is detached, but locked in by the new bone formed closely around it. The whole of the neighbouring part of the shaft is very much enlarged, misshapen, and increased in weight by new bone which has been abundantly formed on its surface. The new bone on the poste-

rior and outer aspects of the tibia is very hard and heavy ; its surface is nearly smooth, compact, yellowish-white, not porous, but perforated by many large, round and oval apertures and irregular gaps. In one situation its surface presents a broad, shallow, transverse groove, with a narrow bridge of bone over it, beneath which the large vessels of the periosteum lying in the groove must have run. On the anterior aspect are two apertures through which the sequestrum is seen ; and around these the character of the new bone is different. At some parts (below and on the inner side of the apertures) it consists of large irregular plates and nodules, separated by wide gaps, composed of a finely cancellous texture, and covered-in by a denser but finely porous layer. Above this part (just on the inner side of the larger cloaca and above it) the surface of some new bone, which, like that covering the posterior and inner aspects of the tibia, had become smooth and very hard, has been overlaid with recent small patches of delicately cancellous osseous deposit. The margins and boundaries of the cloacæ are formed of delicate lamellæ, vertically set, and presenting a coarsely fibrous appearance.

Presented by Sir William Blizard.

1212. Part of a tibia, the lower end of which is considerably enlarged, and bears on its inner wall, just above the epiphysis and malleolus, a circumscribed oval elevation of soft and brittle new bone, with a slightly concave, finely porous surface and an abruptly rounded margin overhanging the adjacent part. Around it new bone has been abundantly formed on both the shaft and the epiphysis ; but the whole bone, which is that of a young person, is very light. The sharply circumscribed elevations of bone in this and the following specimens were, doubtless, formed beneath chronic ulcers of the integuments. *Hunterian.*

1213. A nearly similar specimen, in which the new bone has become heavier and harder. *Hunterian.*

1214. A similar specimen, but with more general enlargement of the tibia. *Hunterian.*

1215. Part of a fibula, the lower half of which is enlarged and thickly covered with new bone, which is especially accumulated on one circumscribed spot just above the malleolus. *Hunterian.*

1216. A tibia, on the lower part of which a large quantity of new bone had been formed but was subsequently removed by ulceration or necrosis, leaving an oval space nearly three inches long, at the base of which the surface of the original wall is exposed, slightly roughened by ulceration. Around the oval space the remaining portion of the new bone forms an irregular elevated margin, and extends round the tibia and as low as the internal malleolus. *Hunterian.*

1217. A tibia in which there has been necrosis of a portion of the anterior wall. The sequestrum is completely separated. It comprises a narrow strip of the deeper part of the wall, about five inches long, and an oval portion of the outer layers of the wall. The former portion, though loose, is nearly enclosed by new bone which has been abundantly formed on all the surviving part of the shaft; the latter is exposed, and its anterior surface is thickly covered with new bone, which has perished with it. The new bone on the sequestrum is longitudinally grooved; that encasing it is nodular and laminated. It is probable that, as in the preceding cases, there had been a circumscribed formation of new bone, which perished, together with a large portion of the deeper and previously healthy part of the shaft.

Presented by Sir William Blizard.

1218. A large, thin, oval sequestrum of porous and finely cancellous new bone, spontaneously separated from the front of the tibia. *Presented by Sir William Blizard.*

The principal specimens of Superficial Deposits of New Bone, besides those already referred to, are Nos. 1384 to 1390, 1471, 1478, 1483, 1484, 1488, 1492, 1504 to 1507, 1509, 1510, 1513, 1515, &c.

Specimens of Ulceration and Necrosis of New Bone are Nos. 1407 to 1409, 1412, 1414, &c.

Subdivision B. *Inflammation of Bones, producing Increased Thickness of Walls, whether with Expansion, Rarefaction, or Softening, and followed by Increased Hardness and Weight.*—Osteo-porosis; Osteitis rarefaciens; Osteitis deformans; Sclerosis of Bone, &c.

Chiefly affecting the Walls: 1219 to 1241, 1257, 1328–29.
Chiefly affecting Cancellous Tissue: 1242–43.
See also 653 to 656, 659, 660, 688 to 694.

1219. Vertical sections of a tibia in which a portion of the anterior wall, about four inches long, is increased to half an inch in thickness. The increase appears consequent, chiefly, on a separation of the osseous laminæ of the wall, several of which may be traced at the upper and lower parts of the enlargement: in the middle they are confused, as if by the formation of new bone and thickening of the cancellous tissue between them. The surface of the thickened portion is rough, porous, and covered with a thin layer of new bone. The posterior wall of the tibia is not thickened; but some of its laminæ are slightly separated, and the apertures for vessels on its surface are enlarged.

Presented by Sir William Blizard.

1220. The corresponding ends of a femur and tibia from a young child. The epiphyses, of which the ossification is incomplete, have separated and are light and spongy; their cartilaginous parts have been removed in maceration. The lower part of the shaft of the femur is enlarged in consequence, apparently, of the separation and expansion of the outer laminæ of the whole circumference of the wall—a process which has been preceded or attended by extreme atrophy. On the posterior part of the femur the separated outer laminæ form a layer about three lines in thickness, the external surface of which is soft and porous and presents numerous apertures, the result of atrophy. Within this is a layer of finely cancellous bone, composed of delicate osseous filaments, set, for the most part, vertically upon

the outer surface of the inner laminæ of the wall. On the anterior part of the shaft the outer lamina has been more widely separated, and a much greater part of it removed by atrophy. The lower portion of it alone forms a continuous layer of soft compact bone; above, nothing remains except thin filmy lamellæ attached to the ends of filaments, which form here, as on the posterior wall, a delicate network of cancellous texture, intermediate between the internal layers of the wall and the remains of the separated external layer. The internal layers of the wall of the femur are thus enclosed within a quantity of delicate cancellous tissue, which, together with the separated and expanded outer layers investing it, forms a kind of second shaft around them: the tissue of the inner layers is soft, thin, and light. The upper end of the tibia is in a state similar to that already described. The separated and expanded outer layer is imperfect, but thicker than that on the femur; the cancellous tissue beneath it does not form so thick a layer; but the changes which the whole bone has undergone are essentially the same.

The patient was a boy $2\frac{1}{2}$ years old. He had an abscess at the knee, which burst spontaneously, and exposed the portions of bone preserved. Numerous other abscesses formed, and from them he died exhausted with the discharge.

From the Museum of Robert Liston, Esq.

1221. The lower end of a child's femur, in which it is probable that there had been disease of the epiphysis of the same kind as that in the lower part of the shaft of the femur last described. The shaft is here slightly enlarged, light and atrophied; but its texture appears healthy. The epiphysis is enlarged to twice its natural dimensions, and, except by the intercondyloid fossa, its original form could hardly be discerned. Its articular cartilages have been removed, and the subjacent surfaces are ulcerated; its internal structure is light, expanded, finely and irregularly cancellous, and full of fatty matter. The sides of the condyles are covered by a very thin, flexible layer of light compact bone, perforated by many large apertures for vessels.

Presented by Sir William Blizard.

1222. Section of a femur, of which the shaft is enlarged by thickening of its walls, but is scarcely increased in weight. The thickening depends partly on the external formation of a thin layer of new bone, which is smooth and hard, and in some situations forms bridges over the large transverse vessels of the periosteum. But the chief increase of the wall appears to be the consequence of expansion of its outer layers (and, in some parts, of all its layers) into the form of a coarse cancellous texture, the chief plates of which have a longitudinal direction, and represent the layers of which the wall was originally composed. The lamellæ in this cancellous texture are thick and hard, contrasting strongly with the original medullary texture of the femur, which is peculiarly delicate and light.

Presented by Sir William Blizard.

1223. A section of the same femur.

1224. A tibia, the shaft of which is enlarged without a corresponding increase of weight. In its general external characters it so exactly resembles the femur last described, that it may be believed to be from the opposite limb of the same person and to have the same change of structure within. In its surface, especially on its posterior part, there are several very large apertures and grooves for blood-vessels; the channel for the great medullary artery is nearly twice as large as is natural.

1225. A portion of the shaft of a femur divided vertically. The shaft is surrounded for four inches of its length by a thick layer of dense new bone, which is irregular on the surface and perforated by numerous apertures for the transmission of vessels. On the cut surface the outline of the compact wall of the shaft can with difficulty be made out, the newly formed bone having coalesced with it. The medullary canal within the affected portion of the bone is completely filled with granular, hard, but in places finely porous, bone. The rounded aperture in the new bone was made in the operation of trephining.

Removed after death from a young lady, aged 24, who for some years had suffered from extremely severe pain in the thigh. The pain was of the intensity and persistence of that associated with abscess in bone; and it was under the impression that such a condition existed that trephining was performed.

Presented by Sir James Paget, 1878.

1226. A vertical section of a tibia in which nearly the whole shaft is enlarged and increased in weight by the external addition of new bone and by the thickening of its walls. Its surface is hard and nearly smooth, but marked by grooves and large apertures for the passage of blood-vessels. Together with the external formation of new bone, the lamellæ of the walls appear as if separated and expanded. The walls consist now of a hard and coarse cancellous tissue, whose largest plates lie longitudinally. The medullary tube is a little narrowed by the thickness of the walls; its tissue is healthy, except in that its cancelli are thickened opposite the most diseased part of the walls.

From the Museum of Robert Liston, Esq.

1227. Section of a tibia, of which the whole shaft is enlarged and increased in weight. Its surface is, for the most part, smooth, hard, and marked by superficial transverse branching grooves. The enlargement appears to be chiefly consequent on the expansion of the outer layers of the walls. The outlines of parts of the original outer and inner layers, which have retained their compactness, can be traced on the surface of the section. They are separated by a coarse cancellous texture, the principal lamellæ of which have a longitudinal direction, and which, in many parts, has become, by thickening and coalition of its lamellæ, nearly as solid and as hard as ivory. A similar process of hardening and consolidation by thickening of the lamellæ has taken place in the cancellous tissue of the medullary tube, so that the texture of the tibia is nearly uniform throughout. At the posterior and upper part of the shaft are two small oval apertures through its walls. They lead to a large chambered cavity in the interior, which probably contained

pus; there are some similar cavities of smaller size in the lower part of the shaft, which do not open externally.

From the Museum of Robert Liston, Esq.

1228. A vertical section of the same tibia.

1229. The upper half of the right femur of the person from whom the section of the left femur, described in No. 659, was taken. It is similarly diseased, and has all the same external characters.

Presented by Sir William Blizard.

1230. Three transverse sections of the shaft of the femur described in No. 195, and displaying the same changes.

Another section is No. 659.

Presented by Sir William Blizard.

1231. Section of a left femur, of which the shaft, in its lower two thirds, was between eight and nine inches in circumference. The surface of the enlarged part is in some situations nearly smooth, but perforated by minute vascular apertures and transversely grooved; in others, and especially in its lower part, it is covered with irregular plates and processes of new bone. Just above the condyles are some syphilitic ulcers (others, of larger size, are shown in the next specimen). The upper third of the shaft and the articular end appear healthy. The surface of the section shows that, though there has been more superficial formation of new bone than in some of the preceding specimens, yet the enlargement is mainly due to the same changes as have taken place in them. In its upper half the texture of the enlarged part is uniformly heavy, ivory-like and almost solid. Only traces remain of the cancellous tissue of the medullary tube and of the inner layers of the original wall, which now, by its thickening and consolidation and by the accumulation of new bone on its surface, is in some parts upwards of an inch in thickness. The lower half of the

enlarged part presents similar changes in a less advanced stage. The wall is expanded; and portions of it are solidified and hardened: the lamellæ of part of the cancellous tissue in this part are thickened and have nearly coalesced. In many parts of the hardened tissue, also, are small irregular cavities, such as may have contained pus.

Presented by Sir William Blizard.

1232. Section of the same femur.

1233. A tibia, apparently from the same limb as the femur last described. The whole shaft is similarly and equally enlarged, and probably by the same disease, though its tissue is somewhat less heavy. Its articular surfaces are healthy.

1234. Vertical section of a tibia, of which the anterior wall is increased to an inch in thickness, apparently by expansion of its texture and the formation of new bone on its surface. The thickened wall is throughout as hard and compact as healthy bone; but along the middle of its cut surface a line may be traced marking the boundary between that part of the thickening which is due to the formation of new bone on the surface, and that part which results from the increase and consolidation of the original wall. The two parts have intimately coalesced; but the grain of the new bone may still be seen to be transverse, and that of the old wall longitudinal. The surface of the thickened wall is smooth and regularly arched.

Presented by Sir William Blizard.

1235. The humerus of an Ostrich, nearly the whole shaft of which is considerably enlarged and increased in weight. Its external surface is smooth and, in parts, finely perforated for the passage of vessels. *Hunterian.*

1236. Two of the carpal bones of a large bird irregularly enlarged about the middle of their shafts. *Hunterian.*

1237 The skeleton of a Fowl, of which the extremities are much enlarged by symmetrical thickening of the shafts of most of the bones. The humerus, radius, ulna and metacarpal bones are affected in the upper extremity; the femur, tibia, and metatarsal bones in the lower. The medullary cavities in the bones, normally empty in a Fowl, are filled with porous bone. The joints appear to be normal. The disease consists of a growth of new bone of variable density, and in many places containing much fatty matter. Except in the quality of the bone produced, it would seem to correspond with other cases of general osteitis of the long bones either in man or the lower animals.

For full description and drawings, see MS. Notes, vol. i. p. 429.

Purchased, 1872.

1237 A. The femur of a Fowl affected with osteitis. The shaft of the bone is uniformly thickened; and in its centre the medullary canal is filled up with hard new bone penetrated by numerous minute vessels. 1882.

1237 B. The humerus of a Fowl similarly affected. 1882.

1238. The skull of a Peruvian, in which all the bones of the face, as well as the frontal and the adjacent parts of the sphenoidal and parietal bones, are in a remarkable manner enlarged and thickened after the manner of the disease named Leontiasis Ossium. The nasal fossæ and the orbits are nearly closed-up, the superior maxillary bones and the orbital portions of the malar and frontal bones having grown into great knobbed and tuberculated masses in which their original form can hardly be discerned. The adjacent smaller and thinner bones, namely the lacrymal and the orbital and vertical plates of the ethmoid, are diseased in the same manner and in a corresponding degree. Of all the bones seen in the anterior aspect of the face, the left nasal bone and the orbital processes of the malar bones are alone unaffected. The hard palate is similarly diseased; its arch and nearly all the alveoli are obliterated. The posterior

part of the vomer is half an inch in thickness; and the affection has extended in a slight degree to the pterygoid processes of the sphenoid bone. The great alæ of the sphenoid, all the frontal portion of the frontal bone, and the anterior parts of the parietal bones are similarly diseased; but the posterior half of the skull is healthy. The lower jaw is enormously enlarged: at its right angle, and in the greater part of its right half, it measures upwards of five inches in circumference; and all but three of its alveoli are closed-up. The disease has affected its right half more than its left half, extending to the margin of the right condyle, but leaving the left condyle and coronoid process healthy; and the same preponderance of the affection of the right side is observed, though in a less degree, in the other bones of the face and skull.

The external surface of all the bones thus diseased is more or less coarsely knotted and tuberculated; it is hard and dense, and minutely perforated for the passage, probably, of blood-vessels. A section of the lower jaw shows that its interior is composed of an almost uniformly hard and compact but finely porous bone. Traces of the original wall of the jaw are discernible nearly an inch beneath the surface of the most enlarged part; but its medullary cavity is filled up with the same kind of osseous substance as that which is outside the trace of the wall.

On the whole, the change in this jaw most resembles those which (as in the preceding specimens) are produced by the expansion of part of the walls of a bone, and the filling-up of the spaces thus formed as well as of those in the original cancellous tissue.

Compare with this specimen No. 1606, in which a disease, apparently similar, has given rise to growths like tumours in the orbits.

From the Museum of Joshua Brookes, Esq.

1239. One half of the vertex of a skull affected with Osteitis Deformans. All the sutures are obliterated; and the thickness of the bone is in every part much increased. On the median vertical section the frontal bone measures

11 to 13 lines, the parietal 14 to 16, and the occipital 8 to 12; each bone having increased to about four times its normal thickness. The outer surface of the skull is finely reticulate, or else porous, and perforated by innumerable apertures for blood-vessels. The inner surface is little changed except by enlargement of all the channels and apertures for blood-vessels. The cut surfaces are for the most part dense and compact like limestone, but in some parts are porous, cancellous, or cavernous; the spaces were filled with a soft reddish substance like medulla. Larger cavities also exist in which cancerous growths were lodged.

1240. The posterior half of the right femur, with the patella, from the same person as the preceding specimen. The femur is considerably but gradually curved throughout its whole length; its compact tissue is much increased in thickness and is very dense, but exhibits numerous minute pores or apertures of blood-vessels; its surface is uneven and minutely nodulated. The cancellous tissue of the lower extremity is coarser, with denser trabeculæ than normal, and the meshes are elongated and have a vertical arrangement; but the cancellous tissue of the upper extremity is almost obliterated by the formation of hard chalk-like bone. The increased thickness of the compact wall of the shaft extends over the great trochanter to the head and neck; and the margin of the articular surface is "lipped" by outgrowths of bone. The patella is enlarged; its walls are from three to five lines thick, and its articular surfaces are unusually concave.

1241. The inner half of the left tibia from the same person, preserved in spirit. The tibia also presents a gradual anterior curvature, and has undergone changes similar to those described in the account of the preceding specimen.

The number of Haversian systems are found, on microscopic examination, to be relatively diminished; the canals are much dilated, many of them being confluent; but the blood-vessels are usually small in comparison with the size of the canals. The arrangement of the intervening spaces is most complex.

Other characters of the affected bones support the theory that

the disease is essentially inflammatory. "The sides of the widened [Haversian] canals, instead of being smooth and even, are eaten out in a series of curves or concavities with the production of what are called Howship's lacunæ, so characteristic of inflammation. The tissue contained in the canals, too, almost precisely resembles the tissue in the spaces of inflamed bones." &c.

The three preceding specimens were taken from a gentleman, aged 68, in whom enlargement of the bones of the lower extremity had been observed for 22 years. When 46 years of age he became subject to aching pains in the legs and thighs; and about a year later he noticed that the left shin was mis-shapen. His hat became too tight from the enlargement of the skull, and he was obliged, year by year, to take successively larger sizes. After the lapse of 13 years both tibiæ and femora presented well marked anterior curvatures; they were enlarged and heavy; and the surface of the tibiæ felt nodular and uneven. The spine had gradually yielded under the weight of the trunk and head, so that he had lost about four inches in height; and when the head was held at ease, the chin was more than an inch lower than the top of the sternum. A few years before death, mitral disease, inflammation of the left knee-joint, retinal hæmorrhage, and deafness supervened, followed by the appearance of a tumour of the left radius two months before his death, which took place from pleurisy. On post-mortem examination, a sarcoma was found involving the radius; and the skull, pleura, and anterior mediastinum also contained similar morbid growths.

For a full account of the case with figures, see the Memoir by Sir James Paget, "On a Form of Chronic Inflammation of Bones (osteitis deformans)," Medico-Chir. Trans. vol. lx. The other halves of the same bones are in the Museum of St. Bartholomew's Hospital, Nos. 73 and 74.

Presented with the two preceding specimens by Sir James Paget, 1876.

1241 A. A calvarium much increased in thickness, and with changes very like those described in the specimen No. 1239. The outer surface is irregular and grooved by channels of blood-vessels. On both sides of the sagittal suture the external table is, in places, cancellous.

1241 B. Two sections from the preceding specimen.

1241 C. The bones of a leg and foot. The tibia is equally curved throughout its whole length, describing the arc of a large circle; its shaft is thickened, flattened from side to side,

and irregular on the surface. The apertures for small vessels are unusually numerous. The fibula is also increased in thickness; but instead of becoming curved in adaptation to the gradually increasing curvature of the tibia, it has been fractured at the junction of the middle and lower thirds. The fractured surfaces were united by ligament only, and, from the manner of their apposition, appear to have altered their relative position as the curvature of the tibia increased. The walls of the bones are entirely composed, as shown by the section, of compact tissue; and the medullary cavities are irregular in form. The inferior articular surface of the tibia is directed downwards and backwards; and in adaptation to its altered position, the direction of the articular surfaces of the astragalus and os calcis have become somewhat modified. The head of the astragalus projects downwards into the sole, the arch of which is lost.

The leg was removed from a young gentleman, aged 23 years. He had been delicate from a child, and inherited from his mother a strongly marked gouty diathesis. The disease of the tibia first showed itself when he was 18 months old, as a slight swelling, without heat or pain, "in front of the lower end of the tibia, as if from periosteal thickening." From that time the disease gradually progressed although great care was taken to keep him off his feet, and a supporting apparatus was constantly used. When he had reached the age of 13, the whole leg was wasted, but there was no shortening, and no curvature of the bones, the instruments having kept them straight. The instruments were then lightened, and after some time left off altogether. The bones of the leg then became curved, and he suffered from frequent attacks of pain, with swelling of the middle thirds of the tibia and fibula. Contraction of the muscles of the limb took place; and it was finally removed as a useless member.

Presented by Henry G. Bull, Esq., M.D., 1881.

Inflammation of Bone producing Consolidation of the Cancellous Tissue: 1242, 1243.

1242. Section of a femur of which the lower half is slightly enlarged, but with no other apparent change besides an increase of healthy cancellous tissue. The surface of the enlarged part is nearly smooth. The middle of the shaft appears externally quite healthy, except that it has a greater

than ordinary curve anteriorly, from rickets; but internally a portion of the cancellous tissue of irregular form, and nearly two inches in length, is consolidated into a mass of hard ivory-like bone, with a small cavity in its centre, and on one side so united with the wall that the boundary between them is indiscernible. About the borders of the consolidated part the lamellæ of the cancellous tissue (which in other parts of the medullary tube are very delicate) are thick and hard, and in a few small places are united so as to form nearly solid bone. The walls of the shaft surrounding the consolidated portion of the cancellous texture appear healthy, as is also all the upper part of the femur.

Hunterian.

1243. Another section of the same femur. *Hunterian.*

Subdivision C. *Inflammation with Suppuration in Bone*: 1244 to 1247 D; 2071.

Tuberculosis: 1247 A to 1247 B; 2062, 2065, 2068, 2076.

1244. The upper part of a tibia, on the outer side of the head of which is a large and deep ulcerated cavity with a wide open orifice, such as may have been connected with a circumscribed abscess. The adjacent osseous tissue is nearly healthy. The knee-joint communicates with a part of the cavity; and the articular surfaces are superficially ulcerated.

Hunterian.

1245. A section through the lower end of a left tibia and the surrounding structures. The articular end of the tibia is healthy; but the shaft is very dense and heavy, and in its interior is a retort-shaped cavity about two inches in vertical measurement and lined with a smooth membrane. This cavity contained pus. Its neck, or upper and narrower part, is directed towards the integument and opens into the base of a large ulcer with which its lining membrane is continuous. The edges of the ulcer are thickened; the granulations at its base are elevated; but, on microsco-

pical examination, no signs of epithelioma could be detected.

From a man aged 32, who as a lad had enjoyed good health. Fifteen years before amputation he first had pain over the lower part of the left tibia; an abscess soon formed and was opened, much pus being evacuated. The discharge continued for several months, and then some spicules of bone came away. For four years he was able to walk about and work; then inflammation about the tibia recurred, and some bone was removed. A second operation for the removal of bone was performed 18 months before amputation. The external wound, over the site of the abscess, had never healed. The patient was able to work until three weeks before the removal of his left leg. The other half of the tibia is in the Museum of Guy's Hospital. (See MS. Notes, vol. i. p. 323.)

Presented by John Birkett, Esq., 1871.

1246. The upper part of a tibia and fibula. The tibia, which is divided vertically, contains several cavities, which appear to have been abscesses in the cancellous tissue. One of these has perforated the compact wall of the bone under the inner tuberosity. They are lined by a soft membrane composed of imperfectly fibrillated tissue. Their flaky contents consisted of masses of corpuscles resembling pus-cells. No evidence of the presence of hydatids could be detected. At one place, behind the most external cavity, the cancellous structure has suffered necrosis, and at several other points it appears to be softened.

Presented by Richard Partridge, Esq., 1868.

1246 A. Portion of a calvarium. On the left side of the frontal bone the inner table is destroyed for a space about an inch and a half long and one inch broad, in consequence of the formation of an abscess following an injury. At two spots in the anterior portion of the affected part complete perforation of the cranial walls has taken place. The larger of the two openings is somewhat circular in form and nearly half an inch in diameter.

From a young seaman, who, falling into the hold of a ship, received a concussion of the brain and remained insensible for sixteen hours. After recovering from the shock, he had the usual

inflammatory symptoms consequent upon such an injury. These appeared to yield to severe depletions, and he was able to return to his duty, though never feeling quite well. About five months from the accident he became gradually sluggish, had violent headaches, dilated pupils, occasional sickness, with irregularity of bowels, appetite, and pulse; he was very irritable and quarrelsome (contrary to his natural disposition), and frequently comatose, though readily roused. A small tumour soon appeared on the left side of the forehead, which quickly became painful and evidently contained fluid. The other symptoms grew worse; urine and fæces passed involuntarily; delirium and severe rigors, followed by epileptic fits, came on; and he sank, exhausted, nine months after the accident.

On dissection, the tumour, which was of the size of a small walnut, was found to contain pus and to communicate through the opening in the skull-wall with an abscess within. The brain-substance around this was condensed, and the surrounding dura mater firmly adherent to the bone, so as to limit the extension of the pus internally.

Presented by Sir Stephen L. Hammick.

1247. Sections of a tibia, fibula, and part of a femur affected with acute osteitis. The bone is much rarefied in texture, especially near the epiphyses; when fresh the trabeculæ of the cancellous tissue were filled with caseous yellow pus.

From a boy aged 15, who suffered from an abscess over the outer side of the ankle. A fortnight after it appeared the knee became swollen. Amputation was performed; but the patient died of exhaustion. (See MS. Notes, vol. ii. p. 128.)

Presented by John Birkett, Esq., 1874.

1247 A. Sections of the heads of the femur, tibia, and fibula of a young person. The osseous tissue is rendered soft and light by atrophy; and the cancellous spaces in a great part of both the epiphyses and the adjacent portions of the shafts are filled with tuberculous matter, which has a coarsely granular aspect. The articular surfaces are healthy, except at one part.

The patient died of pulmonary phthisis after the amputation of the limb.

From the Museum of George Langstaff, Esq.

1247 B. A vertical section of the knee-joint of a child. The cavity of the joint is completely filled with dense false-membranous substance uniting all the articular surfaces. The articular cartilages have been extensively, but for the most part superficially ulcerated; their sections may be traced over the heads of the bones, to which their remains are still closely united. The section of the patella exhibits a large and rather firm granular mass of pale yellow tuberculous matter lying in a cavity in its interior. It projects a little from the inner surface of the patella; and the bone immediately adjacent to it is more vascular than elsewhere. The other bones are healthy in every part.

The disease was of three years' standing.

From the Museum of Sir A. P. Cooper.

1247 C. A clavicle, in the outer half of which the walls are dilated and in many places destroyed and perforated, so that their remains form a kind of irregular network of osseous tissue. The greater part of the cancellous tissue has been removed, leaving a cavity intersected by a few portions of bone. All the remaining tissue is very light and porous.

These changes were probably consequent on scrofulous suppuration within the clavicle.

From the Museum of Robert Liston, Esq.

1247 D. A portion of the lower extremity of a Pigeon with a large rounded projection near the tarso-metatarsal articulation, and some general swelling of the leg. The swelling, as shown by the section, is due to a rounded mass of caseous tubercle, which has formed within the lower extremity of the tibia and expanded the walls of the bone around it. Other deposits of tubercle are situated in the medullary canal, one of these, about the centre of the shaft, being of considerable size. (See Trans. Path. Soc. vol. xxxiii. 1882.)

Presented by Samuel G. Shattock, Esq., 1882.

Subdivision D. *Ulceration.*

Simple, from inflammation, pressure, &c.: 1248 to 1263.
Of articular surfaces: 1264 to 1275.
Carious: 1276 to 1285.
Caries without suppuration: 1285 A.
Chronic Rheumatic--Arthritic: 1286 to 1288; and in next Series, 1898 to 1919.
Mycetomatous: 1289. See also the Index of the Series of Diseases of the Skin.
Syphilitic: 1290 to 1333, 1231 to 1233.
Cancerous: 1334 to 1337.
Necrosis of Ulcerated Bone: 1407 to 1411, 1414, 1429, 1436, 1443, 1535-6.

1248. The stump of a femur. Its sawn extremity suffered necrosis and was in process of separation, a shallow broad groove having formed between it and the adjacent living bone. Above the groove, the anterior part of the shaft is superficially ulcerated; on its posterior part thin layers of soft and porous new bone, longitudinally grooved, have been formed. The ulceration has made numerous sharp-edged pits and holes, of various size and shape, in the outer laminæ of the shaft as well as in some of the new bone thereon, and, penetrating through them to various depths, has formed rough uneven channels and small cavities in the compact substance beneath them.

Presented by Sir William Blizard.

1249. The upper part of a skull, exhibiting superficial ulceration of both tables of the frontal bone and of part of the left parietal bone. The disease was probably connected with acute suppuration between the bone and the pericranium and dura mater, the consequence of injury; for, on the left frontal prominence, there is a fissure through the part at which the ulceration has made most progress. The ulceration has, for the most part, proceeded uniformly through the superficial layers of both the tables of the skull, leaving only a few small irregular portions of them, which retain their healthy texture and smooth surface and are elevated, like islands, on the surrounding rough, uneven, and as if corroded bone. On the left frontal prominence, the ulceration has formed several small apertures through the whole

thickness of the skull. The bone thus ulcerated, and deprived of its supply of blood by the detachment of its vessels with the pericranium and dura mater, died and was in progress of separation. At its lower part it is bounded by a deep ulcerated groove, which in many places has penetrated through the skull; and around its other borders the adjacent bone appears to have been more than naturally vascular. *Hunterian.*

1250. A portion of an occipital bone, in which ulceration of the inner table, resulting in complete perforation, is said to have followed upon an injury. It is not improbable that the injury may have been a punctured fracture.

From a seaman who, while drunk, fell against a door-scraper. An apparently slight wound of the scalp was the result, with very little hæmorrhage. The next day he did his work as usual and was tolerably well, only feeling a little pain in the head. During the succeeding week he was several times intoxicated; and about fourteen days after the accident he became unable to go on with his duty, having increased pain in the head, shiverings, drowsiness, nausea, general debility and feeble pulse. The external wound had healed. He gradually became worse; and on the twenty-third day he was found in his hammock insensible, and in a few hours died.

Presented by Sir Stephen L. Hammick.

1251. A large portion of a parietal bone which was exfoliated after being ulcerated on both surfaces. *Hunterian.*

1252. The lower end of a femur and the upper end of a tibia, exhibiting the effects of the pressure of a popliteal aneurism. The posterior wall of each bone is superficially ulcerated, and around the ulceration a thin layer of new bone is irregularly deposited. *Hunterian.*

1253. Part of a femur, in which there is superficial ulceration of all the posterior surface from the condyles to the division of the linea aspera. At the upper part the ulceration presents exactly the appearance of worm-eaten wood; below

it and around it, and in some situations among the interstices of the small ulcerated apertures, new bone is irregularly formed.

From a patient who died with sloughing of the foot, in consequence of the pressure of a popliteal aneurism. The bones of the leg are preserved in No. 1416. *Hunterian.*

1254. The lower part of a femur, similarly and from the same cause diseased in the portion corresponding to the popliteal space. Its whole tissue is very light; and the articular surfaces of the condyles appear to have been superficially ulcerated. *Hunterian.*

1255. The lower part of a femur, on the posterior surface of which there is an oval ulcerated excavation, with a border of new bone, the consequence of the pressure of a popliteal aneurism. *Hunterian.*

1256. The upper part of a femur, probably from the same limb as the preceding specimen. There has been superficial ulceration of portions of the posterior and inner parts of the neck and of the shaft for about four inches below the trochanter minor. New bone is formed irregularly around the ulceration and in considerable quantity upon the anterior surface of the corresponding part of the shaft. The vascularity of all the rest of the shaft was increased. *Hunterian.*

1257. The upper part of a femur of which the inner aspect of the shaft is superficially ulcerated. Around the ulceration are thin irregular deposits of new bone. Independently of this superaddition, the walls are increased to a thickness of from four to six lines, and the medullary cavity is proportionally diminished in diameter. *Hunterian.*

1258. A clavicle, superficially ulcerated in nearly every part. Where ulceration has not taken place, new bone has been formed upon the surface. *Hunterian.*

1259. An os innominatum, superficially ulcerated upon and around that part of its anterior border over which the psoas and iliacus muscles passed. Around the ulceration new bone is, in a few places, irregularly deposited. The changes were connected with the continued contact of the pus of a lumbar abscess. *Hunterian.*

1260. A tibia, on the anterior wall of which there is a long oval superficial ulceration. The ulcerated surface is finely cancellous and porous. Around it new bone is irregularly formed upon the surface of the shaft; and it is probable that the ulceration, before it reached the surface of the tibia, had destroyed a layer of similar new bone which covered the part now exposed. *Hunterian.*

1261. A similar specimen. *Hunterian.*

1262. Part of a fibula, nearly the whole of which is enlarged and covered with hard new bone. A large portion of its outer surface is superficially ulcerated—probably, as in the preceding case, after the ulceration of some new bone which covered it. *Hunterian.*

1263. The upper part of a skull, the inner table and diploe of which, on the left side, were extensively ulcerated, in connexion with several abscesses which formed in the cerebrum after a blow on the head. [See No. 3767.] The ulceration is rather more extensive in the diploe than in the inner table, in which it seems to have made progress in broad, curved, and tortuous grooves, which have left many portions isolated. The base of all the ulcerated part, and the remaining portions of the diploe, are hard and nearly smooth. In two small round apertures the ulceration has also extended through the outer table; the rest of the exterior of the skull is healthy. *From the Museum of John Howship, Esq.*

Ulceration of Articular Surfaces of Bones, including some with the characters of Caries.

1264. A patella, of which (probably in consequence of disease beginning in the soft tissues of the knee-joint) the articular surface has been evenly removed by ulceration, exposing healthy cancellous tissue. *Hunterian.*

1265. A right patella, from a man aged 23, in which nearly the whole of the articular surface has been evenly removed by ulceration, in consequence of disease within the knee-joint. A large formation of new bone has taken place upon the external surface, in the form of vertically disposed ridges ending below in sharp spicules. Externally these are hard and smooth, but they are composed of cancellous structure within. A small piece from the outer side of the bone appears to have been fractured and reunited, as it is marked off from the rest by a vertical fissure.

These changes were attributed to severe inflammation, resulting in abscesses over the bone, following a fall.

Presented by Sir Stephen L. Hammick.

1266. The upper part of a humerus, with the glenoid cavity of the scapula. The articular surfaces of both bones are, as in the last specimen, evenly ulcerated. A small quantity of new bone is formed upon the rest of their surfaces; and their whole tissue is light and spongy.

From the Museum of John Howship, Esq.

1267. The lower parts of a tibia and fibula, with the ossa calcis, astragalus, and scaphoides. Their articular surfaces are all ulcerated, like those of the preceding specimens but less evenly. Small portions of the compact layers forming their articular surfaces remain on the astragalus and os scaphoides; and of these portions, some are perforated by numerous minute round holes, which appear to indicate the mode in which the superficial ulceration made progress—namely, by the formation of separate apertures through the compact articular surface, which coalesced as they gradually

enlarged. In the cancellous tissue thus exposed, the ulceration has, for the most part, extended evenly, but in some situations has penetrated deeply and irregularly: its progress does not appear to have been preceded by any change of texture; for all the tissue exposed by it is healthy. New bone has been abundantly formed on the parts adjacent to those which are ulcerated; and the texture of all that remains is light and spongy but not greasy.

From the Museum of Robert Liston, Esq.

1268. Part of a foot, in which there has been ulceration of the articular surfaces of the scaphoid and cuneiform bones. From the former, all the articular cartilage and a part of the subjacent bone have been removed; on the latter, small portions of the cartilage remain but are loosely connected with the surface of the bone. The ligaments round this joint are thickened and irregularly ulcerated, and were surrounded by spongy granulations. On the upper surface of the cuboid bone is a shallow ulcerated cavity. The other articulations appear healthy, except in that their cartilages are thin.

The patient was a lad 15 years old. The disease commenced, apparently in the scaphoid bone, after external injury.

From the Museum of Robert Liston, Esq.

1269. A vertical section of the lower end of a tibia, from which the articular cartilage and the greater part of the articular surface of the bone have been removed by ulceration. The ulcerated part is covered with a thick layer of granulations, in which many vessels, derived from those of the bone, are injected. On the central part of the bone, which is not ulcerated, no similar granulations are formed. *Hunterian.*

1270. Two sections of an os calcis, in which ulceration has destroyed several portions of the wall and of the superior articular surface and, penetrating to various depths in their substance, has so nearly isolated some small pieces that they appear as if they were being exfoliated after necrosis.

Hunterian.

1271. A thin section of the same os calcis, injected, dried, and preserved in turpentine. Half of it looks as if it had suffered necrosis; for its cancellous spaces are empty, while those of the immediately adjacent portions are full of medulla; but the blood-vessels of the apparently necrosed portion are injected. Its peculiar appearance therefore must be ascribed to the removal of the medulla during the inflammation with which the ulceration, shown in the preceding specimens, was attended. *Hunterian.*

1272. Section of an astragalus, probably from the same foot, similarly diseased. *Hunterian.*

1273. The bones of a great toe, with the distal end of the metatarsal bone. The corresponding articular extremities of the metatarsal bone and first phalanx are deeply ulcerated, and the rest of their tissue is light and porous.

Amputated after long-standing disease with abscess.

From the Museum of Robert Liston, Esq.

1274. The metacarpal and sesamoid bones, with the remains of the first phalanx, of a great toe. The corresponding portions of the metacarpal bone and first phalanx and one sesamoid bone are irregularly ulcerated on their inferior and articular surfaces. The distal end of the first phalanx, and the second phalanx, were removed in a previous amputation, after severe injury: the remains of the shaft of the first phalanx are atrophied; in other respects the tissue adjacent to the ulceration, and exposed by it, is, as in the preceding specimen, healthy.

From the Museum of Robert Liston, Esq.

1275. The bones of an elbow-joint, of which the corresponding articular ends have been irregularly but, in parts, very deeply and extensively ulcerated. Large holes have been made through the heads of both the humerus and the ulna; and of the articular portion of the latter bone hardly more than a thin shell remains. Portions, also, of the heads of the

humerus and radius, including pieces of their articular surfaces, have been nearly detached by ulceration spreading round them. On the front of the inner part of the humerus two small portions of the articular surface remain, and are hard, polished, and ivory-like. New bone has been formed on the surfaces of the shafts near the joint; and the bone which is exposed by the ulceration does not exhibit an unhealthy texture. *Hunterian.*

Specimens of Ulceration of Bone, connected with Diseases of Joints, in other parts of the Museum:—Nos. 612, 943-4, 1403 to 1406, 1418-19, 1478, 1788 to 1792, 1799 to 1802, 1812 to 1856; and others among the specimens of Diseased Joints, referred to in the next Series.

Carious Ulceration of Bone.

1276. A hand, of which the blood-vessels have been injected. The corresponding articular surfaces of the second row of carpal bones and of the metacarpal bones are irregularly ulcerated and numerous small portions of bone have been separated from them. There are traces, also, of extensive ulceration of the integuments over the metacarpal bones of the thumb and little finger, as well as ulcers of the shafts of those bones themselves. All the ulcerated parts appear very vascular. The radio-carpal articulation is healthy.

The disease had existed eight years. Its origin was supposed to be a sprain of the wrist. The patient recovered after amputation.

From the Museum of Robert Liston, Esq.

1277. The bones of a great toe, with the metatarsal bone, amputated after long-continued deeply seated inflammation. The tissue of the metatarsal bone is expanded; its surface is, in great part, covered by finely porous new bone perforated by large apertures for blood-vessels; and, near its distal extremity, it is irregularly and deeply ulcerated. The articular surfaces of this bone, and the phalanges, are healthy. *From the Museum of Robert Liston, Esq.*

1278. The bones of a foot. The os cuboides and the proximal extremity of the fourth metatarsal bone are deeply and

irregularly ulcerated. Their remaining tissue, like that of all the other bones of the foot, is light, soft, and greasy. There are small formations of new bone on those parts of the ossa calcis, astragalus, and scaphoides which are adjacent to the os cuboides; but all their articular surfaces are sound. The whole foot is flattened. At the side of the preparation are separated portions of the os cuboides and the proximal end of the fifth metatarsal bone, both deeply ulcerated, which were removed by operation two years before the amputation of the leg. The proximal end of the remaining (distal) part of the metatarsal bone is smoothly rounded.

From a man 20 years old. Amputation was performed in consequence of the reappearance of the disease after the removal of the portions of the cuboid and fifth metatarsal bones; and he recovered.

From the Museum of Robert Liston, Esq.

1279. The bones of the anterior part of a foot, after amputation in front of the os calcis and astragalus. Nothing remains of the metatarsal bone of the great toe except its proximal extremity, which is deeply ulcerated. The internal cuneiform bone and its metatarsal articular surface are superficially ulcerated, as is also that part of the shaft of the second metatarsal bone which is adjacent to the remains of the first. The other bones are sound but light and greasy.

The patient was a man 25 years old, of unhealthy constitution. Twelve years before the amputation of the foot, part of the diseased metatarsal bone, with the phalanges of the great toe, had been removed, but the disease recurred. After the amputation he recovered.

From the Museum of Robert Liston, Esq.

1280. The bones of a tarsus and metatarsus. The scaphoid, cuboid, and cuneiform bones and the proximal extremities of the first four metatarsal bones are almost completely destroyed by ulceration. Nothing remains of them but some shapeless fragments of a light cancellous tissue, portions of which were loose and detached. The cuboid bone has suffered less than the others. The tarsal articular surfaces of the os calcis, astragalus, and fifth metatarsal bone are ulcerated; and their texture is light and very greasy, as

is also that of the shafts and distal extremities of the other metatarsal bones.

From the Museum of Robert Liston, Esq.

1281. Section of the foot of a young person affected with scrofulous ulceration of the tarsal bones. The principal seat of the disease is in the contiguous articular surfaces of the astragalus, os calcis, and scaphoid, from which the cartilages are in great part removed. From the interior of the diseased joints several sinuses (indicated by blue glass rods) lead to various parts of the surface of the foot. The largest of these, directly over the instep, is surrounded by a prominent mass of fungous granulations.

From a female, 25 years of age, of scrofulous diathesis. She had suffered from abscesses in the neck, disease of the right sterno-clavicular articulation, and indications of phthisis. The disease in the foot was attributed to the fall of a 28 lb. weight upon the instep, two years before her admission into the hospital; but, although from the time of the accident she suffered occasional pain in the part, it was not until more than a year after that abscesses began to form in connexion with the joint. In consequence of the exhausting discharge seriously affecting her general health, amputation was performed at the lower third of the leg, and she made a good recovery.

Presented by John Hilton, Esq.

1282. Part of the lower end of a femur, from one of the condyles of which the whole of the articular cartilage has been separated in one piece. The surface of the cartilage next to the bone appears healthy, and has many spicula separated from the femur attached to it; its exposed surface is equally healthy; and its thickness is not diminished. The surface of the bone from which it was separated is soft and very irregular, as if ulcerated; its subjacent cancellous tissue is filled with lymph mixed with pus or tuberculous matter.

Hunterian.

1283. The bones of a tarsus. In the os calcis is a deep ulcerated cavity, which opens very widely through its posterior and outer wall. Other portions of the wall are irregularly per-

forated ; and of those which remain some are superficially ulcerated, some are healthy, some have deposits of new bone in pointed processes upon them. The remaining portions of the cancellous tissue and the other tarsal bones are light and greasy. All the articular surfaces are healthy.

From a man 26 years old. A portion of the diseased bone had, before the amputation, been removed with the trephine; and the actual cautery had been repeatedly applied.

From the Museum of Robert Liston, Esq.

1284. An astragalus much altered in form and partially destroyed by extensive caries and necrosis. Two or three sequestra lay in the smooth-walled cavity in the middle of the bone ; and the only cartilaginous surface that remained healthy was that investing the head of the bone.

From a girl aged 12. Four years before the bone was removed she sustained a severe sprain of the right ankle-joint, followed by suppuration. The limb became much wasted ; the soft tissues about the malleoli were swollen ; and pus was freely discharged by sinuses through which dead bone could be felt. The bone was removed by a semilunar incision across the dorsum of the foot. With the aid of an iron support attached to the boot the patient was afterwards able to walk about with freedom and safety. (Trans. Path. Soc. vol. xxiii. p. 193.)

Presented by T. Carr Jackson, Esq., 1872.

1284 A. A section of an os calcis and astralagus. The cancellous tissue of the os calcis has been destroyed, apparently by "rarefying" osteitis; its place is occupied by soft granulation-tissue, containing in places a little bone. In the recent state pus could be detected neither in the bone nor in the surrounding soft parts; and no sinuses could be found. The adjacent joints were healthy.

Removed by amputation from a woman aged 50 years. Considerable swelling about the ankle had existed for many months.

Presented by Jonathan Hutchinson, Esq., 1882.

1285. The metatarsal bone of a little toe singularly altered in

shape by ulceration and the formation of new bone. Its articular extremities are scarcely altered; but its shaft is flattened from above downwards, and nearly an inch in width. Its surface is porous, and in many parts deeply ulcerated. *From the Museum of Robert Liston, Esq.*

Specimens of Carious Ulceration of Bone in other parts of the Museum :— Nos. 1420 ?, 2067 to 2081 A ; and many examples of Ulcerative Disease of the Vertebræ in the Series of Diseases of the Spine.

Ulceration of Bone connected with Chronic Rheumatic Arthritis (Osteo-Arthritis).

1286. The left ulna of an old Lion who had lived long in England. The superior articular surface presents characters similar to those commonly found in human bones affected with chronic rheumatism or rheumatic gout. Its inner and middle parts, exposed by the loss of the articular cartilage, are hardened, grooved in the direction of the movements of the joint, polished and ivory-like. But the greater part of the surface thus hardened is perforated by minute, round, close-set apertures, or larger irregularly shaped holes, which penetrate the adjacent and apparently thickened and indurated cancellous tissue. Hard nodules of new bone form an uneven elevated border round nearly the whole of the articular surface. *Hunterian.*

The other ulna, symmetrically diseased, and some other bones, are preserved in Nos. 1770 to 1772.

1287, 1288. The lower part of a humerus, a radius, and an ulna, similarly but more diseased. The corresponding extremities of all these bones are much enlarged by the heaping-up of irregular coarsely nodulated masses of new bone round the margins of their articular surfaces. These surfaces themselves, as well as those of parts of the new bone, are, in a few places, perforated by small *worm-eaten* apertures, and deeply ulcerated. The ulcers are of irregular size and shape; they have exposed portions of apparently healthy cancellous tissue, have spread more in depth than in extent, and have left portions of the articular surfaces unaltered between them. The parts of the articular surfaces which

are not ulcerated are smooth and very hard, but have lost much of their natural form. Upon parts of the shaft of the humerus, and of the upper portions of the radius and ulna, thin plates of new bone, like those produced in common inflammation, have been formed. In its lower third, the shaft of the ulna is uniformly enlarged and increased in density. The inferior articular extremities of both radius and ulna are diseased in the same manner as the bones of the elbow-joint, but in a less degree. *Hunterian.*

Specimens of similar Chronic Rheumatic Disease of Bone, in other parts of the Museum :—Nos. 638, 639, 676, 1187, 1188, 1900, 1901, 1902, 1904, 1924, 1925, and others referred to after the descriptions of these specimens.

Mycetomatous Ulceration of Bone.

1289. The skeleton of the right foot of an Indian, severely affected with Mycetoma. The anterior row of tarsal bones and the four outer metatarsal bones are converted into a sponge-like mass of osseous tissue by absorption of their substance and the formation of bone around them in the form of anastomosing trabeculæ, enclosing larger and smaller spaces or pores. The newly formed bone, in places, is spiculated or stalactitic. The anterior portion of the os calcis is also spongy ; and the surfaces of nearly all the bones, not otherwise altered, are rough and spiculated.

Presented by Dr. J. Shortt, 1877.

Syphilitic Ulceration of Bone.

Tuberculated : 1290 to 1309.
Annular : 1310 to 1313.
Penetrating : 1314 to 1319.
Reticulated : 1324 to 1329.

1290. A skull, in which syphilitic disease has affected nearly the whole of the frontal, parietal, and occipital bones, and has extended in a slighter degree over the squamous portion of the right temporal bone, the nasal bones, and the nasal pro-

cess of the left superior maxillary bone. Where the disease has made least progress, the surface of the outer table of the skull appears slightly elevated and superficially tuberculated, with deep little foramina and narrow starred fissures intervening between the most elevated parts. In the further progress of the disease these foramina and the centres of the starred fissures appear to have widened into small ulcers of various size and shape, the borders of which are depressed, and either thin and smooth or pointed with little processes of bone radiating towards their centres. Such ulcers enlarging have spread in every direction, but more in width than in depth. Most of them present a round or oval form ; but this form is often lost where two or more ulcers enlarging near each other have coalesced. The borders of the large ulcers, formed by the external table of the skull, generally overhang the more widely ulcerated diploe, and either appear serrated, with wrinkled lines and narrow points of bone radiating towards their centres, or (which is more common) are thin, smooth, rounded, and shelving or turned in, as if they had healed, even while the disease was making progress in the deeper or adjacent parts. The bases of these larger ulcers are very uneven ; where they are formed by the exposed diploe its lamellæ appear thickened, indurated, and confused ; and this is especially the case where the borders of an ulcer have the aspect of being healed. The ulcers which have extended through the whole thickness of the skull have penetrated the inner table by oval or irregular apertures, which are much smaller than those in the outer table of the skull, and many of which are situated at or near the margins of the ulcer, where its base is overhung by the outer table. The surface of the skull near the ulcers, and such small portions of it as remain between them, present signs of slightly increased vascularity. The general plan according to which the disease has made progress is nearly symmetrical.

It is said in the Catalogue of Mr. Brookes's Museum, that after death there were no external indications of this disease except a small sinus through the scalp, just above the forehead.

From the Museum of Joshua Brookes, Esq.

1291. A skull, of which a large portion has been destroyed by tuberculated syphilitic disease, like that shown in the preceding specimen. Three fourths of each parietal bone, including nearly the whole of the sagittal and lambdoid sutures, are removed; and there are numerous large apertures in the portions that remain, as well as in the frontal bone. The external surface of the frontal and parietal bones, where the disease has made least progress, are tuberculated, cracked, and *starred*; in a somewhat more advanced state, there are superficial ulcers of irregular form, with tuberculated bases and smooth shelving margins; and in a later stage, similar ulcers have penetrated the skull by one or more apertures. In these characters the specimen resembles that last described. But it shows, besides, that in many places the same kind of ulceration commenced in the inner table of the skull, and made progress towards perforation from within outwards exactly similar to that which, over a greater extent and in different places, it has made in the opposite direction. Where, also, the outer surface of the inner table has been exposed by ulceration from without, it has in many places acquired a wrinkled and tuberculated appearance, like that with which this disease usually commences in the outer table.

The surfaces of the upper part of the occipital bone are ulcerated in a different manner. Both of them, probably in consequence of acute inflammation occurring in the course of the syphilitic disease, are exceedingly rough and irregular, with sharp-edged, interlacing and confused, shallow pits and channels, like those produced by the diffuse superficial ulceration which occurs in acute inflammation of the surface of a bone, as in Nos. 1248, 1249. In many situations the bone thus ulcerated is completely penetrated, but by small apertures. The ulceration and destruction of the parietal bone is almost exactly symmetrical; that of the frontal and occipital bones is less so.

Presented by William Norris, Esq.

1292. Part of a skull, in which the outer surface of a portion of each frontal bone is, by syphilitic disease, very slightly

elevated and superficially tuberculated. The surface thus affected might be likened to that of a crown of confluent vesicles, and is coloured with various shades of brown. In some situations the little starred fissures and depressions between the more elevated parts of the diseased surface have become deeper and wider, as if by ulceration ; and in others, the surface is penetrated by many small round and irregular ulcers, which appear to reach the diploe, and are bounded by indurated finely cancellous bone. Corresponding with this disease on its exterior, there is a brown spot, with traces of increased vascularity, on the inner surface of each frontal bone. *Hunterian.*

1293. The upper part of a skull, in which the outer surfaces of large portions of the frontal and parietal bones are superficially tuberculated, as in the preceding specimen, but are not changed in colour. All the tuberculated surface bears marks of increased vascularity ; but the minute texture of the bone appears not altered. In several places the diseased surface is penetrated by irregularly shaped ulcers, larger and more numerous than those in the last-described specimen, but having the same general characters. The interior of the skull appears quite healthy. *Hunterian.*

1294. A skull, in which three oval spots, on the exterior of the frontal bone, are very superficially tuberculated and ulcerated. Some of the ulcers are minute and round, like enlarged vascular apertures ; but in two of the spots, the ulceration has formed a shallow groove, a line in width, which extends in a nearly complete circle just within the border of the diseased surface. There are traces of similar disease on each malar bone.

Presented by Sir William Blizard.

1295. A skull, in which the greater part of the os frontis is superficially tuberculated like the last described. In many parts the diseased surface is ulcerated—both perforated by small round or oval ulcers, and grooved with variously

directed channels. In and above the nasal region the ulceration has made greater progress. The frontal sinuses have been laid open by a large ulcer, with uneven jagged margins; and in the adjacent parts the same kind of ulceration extends less deeply. The nasal bones, the greater part of the vomer, the palatine portions of the superior maxillary bones, with parts of their ascending processes, and the front of their alveolar border, have been completely removed by ulceration or necrosis; and the outer surface of the remaining parts of these bones is superficially tuberculated, like the least-diseased part of the os frontis. Several portions of the parietal bones are similarly but very slightly diseased.

Presented by Sir William Blizard.

1296. A skull exhibiting numerous patches of superficial syphilitic disease of the external table of the frontal and parietal bones.

1297. A skull, in which nearly the whole outer surface of the frontal and parietal bones has been the seat of the "tuberculated" form of syphilitic disease. Those parts which were not already ulcerated are tuberculated like the preceding (Nos. 1290 to 1295), but in many situations more deeply, and with wider and deeper stars and fissures between the elevated parts. The ulceration which has attacked the surface thus diseased (for probably the whole surface was thus at first tuberculated) presents three distinct forms:—one marking the ordinary progress of the tuberculated syphilitic disease of the skull; another resembling the destructive penetrating ulceration shown in specimens 1332, 1333, of syphilis of the long bones; and the third indicating that, in the course of this disease the diseased surface of the skull became the seat of acute inflammation, with suppuration between it and the pericranium.

The first mode of ulceration, which is probably of slow progress, presents many of the characters shown in the preceding specimens. Its commencement may be observed

about the margins of the diseased part, where, in many places, the centres and lines of the starred fissures between the elevations of the tuberculated surface are widened into round or linear branching apertures, many of which lead into larger ulcerated spaces in the diploe. In the central parts of the disease (especially about the middle of the frontal bone) similarly formed apertures are enlarged; but most of them retain traces of their origin in the numerous little tortuous and branching grooves which run on the surface of the bone around them converging to their borders. Where these larger apertures exist, the diploe is more widely and irregularly ulcerated beneath them, so that there are cavities with overhanging margins; and these margins, superficially marked by the converging grooves already mentioned, are, for the most part, obliquely inclined towards the bases of the ulcers; and their edges are thin, and either smoothly rounded, or else finely but irregularly dentated or serrated. The bone composing the overhanging margins of the ulcers appears almost always hard and healthy; that which forms their bases is more brittle, as if formed by indurated cancellous tissue.

The second, and probably more rapid form of syphilitic ulceration, is shown at the upper part of the os frontis. Here, in the centre of a part which seems to have been much more vascular than the rest of the skull, numerous small ulcers appear to have coalesced, forming one quite irregular in shape, penetrating deeply, abruptly, and vertically through the outer table and diploe, and in a few small apertures through the inner table also, having all its boundaries uneven, sharp, and jagged, like broken diploe.

The third form of ulceration, ascribed above to acute inflammation supervening in the course of the syphilitic disease, extends over a great part of the outer surface of both parietal bones. It has removed a great portion of the diseased surface, leaving only small patches, like islands, bearing marks of their former tuberculated aspect, and exposing a nearly smooth surface of the deeper part of the outer table and of the diploe.

The first cervical vertebra is ankylosed, with slight lateral

displacement, to the condyles of the occipital bone ; and the second and third are similarly united to one another.

From the Museum of Joshua Brookes, Esq.

1298. A skull, in which the whole of the frontal portion of the frontal bone, and the posterior parts of the two parietal bones, have their outer surfaces tuberculated and extensively destroyed by syphilitic ulcers, like those of the first two forms last described. In general, however, the ulcers in this are deeper than in the preceding specimens ; and in several places they have penetrated, by large apertures, through the skull. The disease in this, as in many of the preceding specimens, exhibits a marked tendency to symmetrical progress. *Hunterian.*

1299. The upper part of a skull, the outer surface of which is in several distinct patches grey, superficially tuberculated and irregularly ulcerated. The general character of the disease is like that in the chronic ulceration shown in the preceding specimens ; but in several places the ulceration has extended yet more deeply than in the last, penetrating, by considerable apertures, through the whole thickness of the skull. At some of the largest of these apertures, as well as at some of the smaller ulcers, the smoothly rounded, shelving borders, formed by the adjacent consolidated and hardened bone, indicate that, after the ulceration, a process of healing had been established. In many parts the whole progress of the disease, commencing with the production of the superficially tuberculated surface, which afterwards became more deeply seamed and cracked, and was then more or less deeply and widely ulcerated, may be clearly traced. Exactly similar changes, but less in extent, have taken place on the interior of the skull, in spots which nearly correspond with those upon its exterior.

1300. The upper part of a skull, in which there are two ulcerated apertures in the left parietal bone close by the sagittal

suture. They are of irregularly oval form, about an inch in diameter; and their margins are abrupt and rough. In the same bone, near the coronal suture, there is a smaller ulcer which, proceeding from without inwards, has penetrated the inner table by a few small apertures. There is another ulcer of the same kind as the last in the middle of the frontal bone; and a third has penetrated through the supraorbital ridge into the orbit. There are also two ulcers of yet smaller size in the left parietal bone, near the squamous suture, and in the right temporal fossa of the frontal bone. New bone has been formed on the inner table by the side of the groove for the longitudinal sinus. The rest of the skull is healthy. The nature of the ulcers is uncertain; but they most nearly resemble those shown in No. 1299.

1301. A skull in which a part of the external surface of the frontal bone is tuberculated. Half of it is slightly depressed, and its surface, though not level, is hard and nearly smooth: it is probably a healed syphilitic ulcer. In the other half of the diseased surface is an ulcer, of unequal depth, having a hard but cracked and tuberculated surface and smooth shelving margins, as if healing. There is a similar ulcer, healed, just above the right orbit.

Presented by Sir William Blizard.

1302. The skull of a native of New South Wales, in which there is an oval, partially healed syphilitic ulcer in the frontal bone, just above the left internal angular process. It is rather deep, and has a tuberculated base, with smooth shelving margins, marked by fine converging lines; its circumference also and the bone adjacent to it are slightly tuberculated and increased in vascularity. There is a small oval pit, with a smooth surface, near the spine of the occipital bone, the result, probably, of the complete healing of a similar but smaller ulcer. A few ulcers of yet smaller size exist on the parietal bones; and the outer table of parts of these bones, as well as of the frontal and occipital bones

presents numerous small round apertures, the orifices of enlarged vascular canals. There is a deep ulcer at each angle of the lower jaw; it was, probably, preceded by necrosis of a portion of the bone.

Presented by —— Bell, Esq.

1303. The upper part of a skull, in which a portion of the middle of the frontal bone was penetrated by numerous round, sharp, and broken-edged ulcers. Subsequently the portion probably perished; for it is nearly surrounded by a deeply ulcerated groove, by which it might soon have been separated as a sequestrum. The surface of the skull around the ulcer is irregularly depressed, as if it had healed after superficial ulceration; and there is a similar smooth depression at the posterior part of the left parietal bone.

Hunterian.

1304. The upper part of a skull, in which, on the right side of the frontal bone, near the coronal suture, there is a syphilitic ulcer, of the chronic tuberculated form, completely perforating both tables. It has the usual shelving borders formed of hard bone. On the left side a much larger portion of the frontal, and the anterior border of the parietal bones have been removed, either by rapid ulceration or, more probably, by necrosis following ulceration, as shown in the last specimen. The borders of the aperture are abrupt; and the tissues of the skull which bound it are less altered than those which bound the other ulcerated aperture; but some of the outer surface adjacent to it is diffusely ulcerated and very vascular. The rest of the skull is healthy, and not tuberculated. *Hunterian.*

1305. A skull, from which a portion of the upper and left wall, four inches in diameter, has been removed, probably after necrosis like that shown in No. 1304. The edges of the aperture are, for the most part, sharp and abrupt, and a little hollowed into the diploe: in one situation the bone adjacent to the aperture is ulcerated, as if by acute inflammation; and at the border of this it is superficially tuber-

culated. The vomer and the greater portion of the hard palate and alveolar border of the upper jaw have been removed ; and the surface of the right malar bone is irregularly thickened and slightly tuberculated. There are other vascular and slightly tuberculated spots on the frontal and parietal bones. The coronal and sagittal sutures are obliterated.

1306. A skull, in which large portions of the frontal and parietal bones suffered necrosis during syphilis. The dead part of the frontal bone includes nearly the whole extent and, in parts, the whole thickness, of its frontal portion, with the supraorbital ridge and the external angular process on each side. It is black, nearly symmetrical in form, and separated by a deep groove from the adjacent living bone. There are several small ulcerated apertures through it; and at its central lower part is a small portion of bone which did not perish with it, but is smoothly ulcerated on its surface. The dead portion of the parietal bones is irregular in form, and superficially ulcerated ; the process of separating it is less advanced than that in the frontal bone. The intermediate external table of the skull is uneven, and parts of it are very superficially ulcerated. There is a deep tuberculated ulcer on the orbital edge of each malar bone, accompanied on the left side by necrosis of small extent ; and the centre of the palate is destroyed. The scalp of the patient is preserved in No. 4047.

Presented by Sir P. M'Grigor.

1307. The upper part of a skull, from which, in the course of tuberculated syphilitic disease, a large portion of the frontal and parietal bones suffered necrosis and exfoliated. Part of the sequestrum, which includes the whole thickness of the skull, is preserved, and loosely fixed in its original place. Its outer surface is superficially ulcerated ; its inner surface finely porous. Other portions, of considerable size, seem to have separated from the outer table only. The diploe exposed by their removal is hardened and nearly solid ; beyond the extent of the necrosis it is in parts widely

destroyed by ulceration burrowing between the tables, and opening through them by apertures, like those formed by the deepening and widening of the star-like fissures in the tuberculated syphilitic skulls. The margin of the outer table bounding the space from which the bone exfoliated presents also the overhanging border and the thin edge which are characteristic of the same disease. The rest of the skull is healthy, except that its diploe is consolidated.

Presented by Sir William Blizard.

1308. A skull, which has been the seat of extensive syphilitic disease. The posterior and lateral regions exhibit only a tuberculated and roughened condition of the surface; but around the vertex ulceration has destroyed the outer table to a large extent, and in several places penetrated through the diploe and inner table. An irregular sinuous groove, extending through the outer table and through more or less of the diploe, distinctly marks off the portion of bone thus affected. The exterior edge of this groove is smooth and rounded, as if healing had commenced there. In some places the outer table is deeply undermined from the ulceration having proceeded more rapidly in the diploe; this is seen particularly in the separate portion of the ulcer situated over the left orbit, which is connected with the larger portion only by a tunnel through the substance of the bone. *Presented by Sir Stephen L. Hammick.*

1309. A skull, from which many large portions have been removed by ulceration or necrosis. The greater part of the frontal portion of the frontal bone, including the anterior wall of the frontal sinuses, large pieces of both parietal bones, of the squamous portions of the temporal bones, and of the occipital bone have been thus removed. The disease has extended even to the foramen magnum, and a part of its border is ulcerated. The borders of many of the ulcers are smoothly rounded and healed; and at these parts the bone presents sufficient traces of the tuberculated form of syphilitic change to mark the original character of the disease. This is especially evident in the ulcer of the

frontal bone and the wall of its sinuses. Other portions of the bone remaining between the apertures are superficially ulcerated; and in many parts the diploe is very widely destroyed.

1310. A skull, in which nearly all the surface of the frontal and parietal bones is superficially tubercular. The skull appears to have been uniformly more vascular than the preceding specimens; and most of the numerous ulcers formed in and around the tubercular parts have characters different from what are there shown. These ulcers are all less than half an inch in diameter; they are, for the most part, isolated, circular or oval, with sharp, abrupt and jagged margins; they penetrate to various depths, and in some instances pass straight through both the tables. In the greater part of them it is evident that the form of the ulcer was at first annular, destroying a narrow ring of bone, and leaving a small central portion healthy, or only superficially ulcerated; in some, near the supercilliary ridge and the lambdoid suture, a central portion has been thus nearly isolated by the ulcer around it penetrating through both the tables. The diploe is not more extensively destroyed than the compact substance is; and there is no appearance of healing. The trephine has been applied in three places in front of the coronal suture. The alveolar border of the upper jaw has been absorbed, probably after the teeth were lost in salivation. The sutures are nearly all obliterated. *Presented by Sir William Blizard.*

1311. A cranium with extensive destruction of scattered portions of the osseous tissue, affecting the diploe more than the outer and inner tables. The affected parts have a worm-eaten appearance like that produced in syphilis.

Presented by Gilbert W. Mackmurdo, Esq., 1867.

1312. The upper part of a skull, in which, from syphilitic disease, nearly the whole outer table is superficially ulcerated. The ulceration presents the "annular" form. It appears to

have commenced in distinct spots, and to have spread either in rings enclosing portions of healthy or ulcerated bone, or in circles; but in most places the ulcers thus formed have coalesced and become diffused, and have extended very irregularly in depth. In a few places small apertures have been made through the skull. The greater part of the posterior half of the right parietal bone has been removed, probably after necrosis. *Hunterian.*

1313. The upper part of a skull, of which both tables were the seat of irregular and very extensive syphilitic ulceration. In a few parts it presents a tuberculated surface; in some it is made porous and finely grooved by the enlargement of its vascular canals; in some the ulcers are superficial and isolated, in some diffuse; and in several places the skull is completely perforated. The diploe, also, is in some parts more extensively destroyed than either of the tables. The characters of the disease are confused; but it is probable that the ulceration had originally the annular form, such as is rather better shown in the preceding specimen, and much more distinctly in the skull described in No. 1310.

Hunterian.

1314. The upper part of a skull, both surfaces of which are nearly covered by minute circular and oval ulcers, from half a line to a line in diameter, and for the most part superficial. The ulcers are least numerous on those parts of the parietal bones over which the temporal muscles lay; on nearly all the rest of the outer surface of the frontal and parietal bones they are so closely crowded together that they appear to form a continuous superficially ulcerated surface, surrounded by enlarged apertures and grooves for blood-vessels. Whether thus crowded, or more thinly scattered, their arrangement is almost exactly symmetrical. On the inner table of the same bones there are many, but less numerous, minute ulcers; and the surface of the inner table is rendered uneven by the formation of new bone and the enlargement of its vascular grooves. Here also the disease is arranged on each side with an almost precise

symmetry. Besides these ulcers, there are some others presenting very different characters, but probably formed by the coalescing and further progress of the preceding. By these the left parietal bone is completely perforated in five places, and the right in one ; and on each of the bones, as well as on the frontal, there are also some deep ulcers, which appear to have been in progress towards perforation, some from within outwards, others in the opposite direction. The cavities and apertures thus formed present a circular or oval shape, and vary in diameter from two to seven lines ; their margins are abrupt and formed of the exposed diploe, of which in some cases the ulceration has destroyed more than it has of either table. New bone has been formed on the inner table around nearly all these larger ulcers ; and on the outer table it constitutes an elevated sinuous border around the largest of all the apertures. Except in that the grooves for vessels are enlarged, the surfaces of the tables intervening between the ulcers are healthy.

The specimen is marked "Sept. 3, 1779. Died about 5 weeks ago, aged 19. G. Brande." And in Mr. Hunter's handwriting, "supposed to be venereal."

Hunterian.

1315. The upper part of a skull, in which are several large oval ulcers, very like those by which the perforations were made in the specimen last described. At the borders of each of these large ulcers there are on both tables numerous isolated, small, circular and oval ulcers, from half a line, or less, to a line in diameter, which penetrate either through the skull or, more or less deeply, into the diploe. These are arranged in nearly circular or oval groups, surrounded on the inner table by rings of new bone, and on the outer table by converging branched grooves, and in some instances by very thin annular formations of new bone. The larger ulcers appear to have been formed by the coalescing of many of the small ones. The formation of the smaller ulcers seems, as in the preceding specimen, to have commenced almost simultaneously in corresponding parts of both tables ; but in their progress they have sometimes destroyed one more widely than the other. In most instances the diploe is

destroyed to a greater extent than either of the tables. The surfaces of the tables intervening between the ulcers or the rings of new bone around them are smooth and healthy. *Presented by Honoratus L. Thomas, Esq.*

1316. The upper part of a skull, in which there are a large irregularly ulcerated perforation in the course of the sagittal suture, and one of smaller size near it in the right parietal bone. Around them there is extensive diffused and pitted or "perforating" ulceration of both the internal and external tables; and around the borders of this are many minute oval and circular ulcers, from a quarter of a line to a line in diameter (some looking like enlarged apertures for vessels), which penetrate, with sharp abrupt margins, straight into or through the table (whether internal or external) of the skull. These minute ulcers are, for the most part, very close-set; and in many places several of them have enlarged and coalesced. The character of the secondary or compound ulcers produced by their confluence is such as makes it highly probable that the whole of the extensive and diffused ulceration, as well as the large apertures in the skull, was also thus produced. All the rest of the skull, even the parts intervening between the most closely-set minute ulcers, appears of healthy texture.
Hunterian.

1317. A skull in which, in the course of syphilitic disease, two large circular portions of the middle of the frontal bone suffered necrosis and are surrounded by a deep groove, separating them from the adjacent tissue. Previous to the necrosis both of them were the seats of numerous minute, circular and oval, sharp-edged and deeply penetrating ulcers, all close-set and some confluent, just like those last described. As in the preceding specimen also, all the tissue intervening between the ulcers is healthy. There are a few similar ulcers, in small groups, on the adjacent part of the frontal bone, and many more groups of them on both parietal bones, near the sagittal suture. The alveolar border of the upper jaw, as far as the sockets of

the first bicuspid teeth on each side, has been completely destroyed by ulceration; and new bone is formed on the right angle of the lower jaw.

Presented by Sir William Blizard.

1318. A skull, of which the greater part of both parietal bones and a portion of the occipital bone have been destroyed by ulceration, which was considered to be syphilitic, but does not present the characters shown in any of the preceding specimens. A large portion of the left parietal bone has been wholly removed; and nearly all the rest of both the parietal bones is ulcerated and perforated by numerous apertures of various form and size. The bone exposed by the ulceration is hard and compact. A similar form of ulceration, in a less advanced stage, is presented in the upper half of the occipital bone. Around the borders of the greater ulceration are numerous minute, oval and circular, deeply penetrating ulcers. There is a mark of a healed fracture or ulcer just above the left orbit. The left middle turbinated bone is much enlarged.

Presented by John Abernethy, Esq.

1319. A calvaria in the same condition as No. 1318; but the disease is more extensive.

From the Collection of Joseph Hodgson, Esq., 1869.

1320. The bones of the upper part of a face. The nasal bones, the nasal processes of the superior maxillary bones, the lacrymal, a great part of the ethmoid, and all the turbinated bones have been removed by ulceration, which was probably of syphilitic origin. The surfaces of the cavity thus exposed are filled-up and made smooth with new bone and appear completely healed. There has also been a large superficial ulcer of the right side of the frontal bone, which has healed smoothly but with depression of the surface. The middle and anterior part of the frontal bone exhibits several smooth irregular elevations.

From the Museum of John Howship, Esq.

1321. A skull, from which the middle and inferior turbinated bones, the palatine portions of the superior maxillary bones, and the whole of the septum nasi, except the posterior border of the vomer, have been removed, probably in consequence of syphilitic disease. *Presented by Sir William Blizard.*

1322. The base of a skull showing the effects of ulceration, probably syphilitic, on the frontal, nasal, and sphenoid bones. There is also a large ulcerated aperture in the anterior part of the palate. The right malar bone appears to have received a comminuted fracture at some former time. Each occipital condyle has two distinct articular surfaces.

From the Collection of Joseph Hodgson, Esq., 1869.

1323. Part of the base of a skull, in which nearly the whole of the hard palate and of the alveolar processes of the upper jaw, together with portions of the septum nasi and of the nasal bones have been destroyed by syphilitic ulceration.

Hunterian.

1324. The left clavicle of the syphilitic patient from whom the specimen No. 1325 was taken. It is enlarged by a smooth external layer of porous, finely perforated and, in parts, delicately reticulated new bone. Some small oval ulcers have penetrated into and through this new bone; and at their borders the bone appears indurated and thickened.

Hunterian.

1325. The left scapula of a man, in whom many bones, as well as this, were affected by syphilis. The femur and tibia in Nos. 1133, 1134, the clavicle in No. 1324, and the humerus, ulnæ, and os frontis next following, are all from the same patient, and exhibit the results of what appears to be the most frequent form of syphilitic inflammation and ulceration of bones. The acromion and border of the spine of the scapula are irregularly thickened and tuberculated by hard new bone formed on their surfaces. The new bone presents, in many parts, a coarse reticular arrangement, as if

bundles of bony fibres, of various size and length, and raised upon the surface, were interlaced. In some few places there are small ulcers in such bone. These form round pits and little vertical channels, of various depths, surrounded by hard and finely cancellous or porous bone; and several of them have made minute apertures through the whole thickness of the acromion. A small quantity of new bone is formed on the surface of the glenoid cavity; and its anterior margin is ulcerated. *Hunterian.*

1326. The humerus of the same limb. The middle of its shaft is enlarged by an irregular external deposit of new bone, which has an uneven, but not nodulated, porous surface and a dense texture. It has completely coalesced with the subjacent wall. *Hunterian.*

1327. The ulnæ of the same person, both of which have the greater parts of their shafts covered with similar but thicker formations of new bone, arranged on each in a nearly symmetrical manner. The new bone is nodulated, fissured, and laminated, and probably was formed at a later period than that on the humerus; it presents scarcely any of the reticular arrangement which the new bone on the acromion has, and, probably, could not be distinguished from new bone formed in common inflammation. Several small ulcers (not symmetrically arranged) penetrate, in nearly round or oval holes, through the new bone, and have extended beneath it to the subjacent walls of the ulnæ, on the surface of which they have spread in sharp-edged and irregular shallow pits and channels. The sections of one of the ulnæ show that its cancellous tissue was healthy, but that the vascular canals in its walls were very large, and that its surface beneath the new bone was quite rough, as if it had been diffusely ulcerated, even where there are no ulcerated apertures in the new bone. *Hunterian.*

1327A. The frontal bone of the same patient, in which are two ulcers, which appear to have commenced in portions of bone previously thickened and tuberculated. *Hunterian.*

1328. A femur, of which the lower three fourths are enlarged, till, increasing from above downwards, its circumference measures about seven inches. The general aspect of the enlarged part closely resembles that of No. 1232, and is doubtless, like it, due both to the superficial formation of new bone and to the expansion of the walls, followed by their consolidation and that of the cancellous tissue; for the enlarged part of the shaft is very heavy. Here also, as in No. 1232, there are syphilitic ulcers on the surface of the enlarged part: they are in this specimen very numerous, and have many of the characters shown in the skulls Nos. 1312, 1313. A few of them have the annular form well marked—a deep ring-like groove, about a line in width, surrounding a small central portion of less ulcerated bone. A few others form small circles, as if the central pieces had been removed from the rings. Other ulcers, again, form larger circles; and in many parts two or more such have coalesced, forming an ulcer of irregular outline. The general depth of these ulcers is about a line; but their bases are uneven, and in many instances deep pits extend below the general base and burrow into the subjacent tissue. All the tissue exposed by the ulceration is like finely cancellous new bone hardened, but not consolidated. The intervening and not ulcerated parts of the surface of the femur are formed of hard smooth new bone, bearing marks of a moderate degree of vascularity.

1329. A radius and ulna, exhibiting more extensive and advanced changes from syphilitic disease. The greater part of the shaft of each is enlarged and covered with new bone, with which its surface has coalesced. The aspect of the new bone is various: in some parts its surface is hard, nearly smooth, and perforated by only a few minute apertures; in some it is porous and friable; and in some, especially on the anterior aspect of the radius, its surface presents a peculiar reticulated appearance, as if, on a previously diseased surface, fresh bands and plates, or thick fibres, of hard new bone had been laid, interlacing in an irregular network. In the parts over which new bone has been formed are many ulcers, pre-

senting chiefly the oval form, and varying from a line to more than an inch in diameter. The ulcers appear to have commenced in the new bone, and, after penetrating through it, to have burrowed deeply into the substance of the shaft, forming irregular cavities and channels in its wall and cancellous tissue, and in some places perforating through its whole thickness. The walls of the ulcerated cavities are formed of bone which is harder, but more brittle, than the rest, and much of which is porous, and looks as if its lamellæ had been thickened and the porous spaces between them filled by some morbid substance. *Hunterian.*

1330. A tibia, on the anterior surface of which, near its lower end, is a large oval syphilitic ulcer. Nearly all the shaft is covered with new bone, like that in the last preparation. The ulcer, widely destroying the new bone, has in several places perforated through the subjacent wall of the tibia, and has spread deeply in the medullary tissue. The surface of the cancellous tissue exposed by the ulceration is filled up as if by thickening and coalescing of its lamellæ ; and the borders of some of the ulcerated apertures appear to be formed by hard bands of new bone, which, as in the preceding preparation, are arranged in a coarse network.

Hunterian.

1331. A tibia from a syphilitic patient. An elongated carious excavation extends from the surface of the bone inwards to the cancellous tissue, partly occupying the place of the medullary cavity. Much new bone has been formed externally, appearing in parts as a simple thickening of the compact tissue, in others appearing in the form of osteophytic growths. The cancellous tissue has greatly extended beyond its normal limits.

The patient, a middle-aged man, had suffered long before his death from an indurated chancre and enlarged inguinal glands, for which he was severely mercurialized. He afterwards was subject to frequent skin eruptions, sore throat, and indurated testes. Seven years before death nodes appeared on the tibia. This affection passed away and frequently recurred, yielding from time to time to iodide of potassium. But the tibia, at first only diseased below, became irregularly enlarged throughout and in-

tensely painful, especially at night: suppuration took place in the bone, and pus was let out through incisions made at several points. Then a large slowly spreading ulcer formed over the tibia, and the leg became very œdematous and painful, so that at length it was found necessary to perform amputation above the knee. The patient died of secondary hæmorrhage at the end of thirteen days. The joints of the limb were healthy, but the fibula was affected in a like manner to the tibia.

Presented by John Gay, Esq., 1871.

1332. A fibula, the greater part of which is covered with hardened new bone. Some of its surface is reticulated; and through this part, on the outer aspect, an oval syphilitic ulcer has penetrated deep into the subjacent substance of the shaft. The walls of the ulcer are very irregular: they are formed of hard, but brittle and finely cancellous bone; and the ulcer extends deeply at its upper part, burrowing under the surface. *Hunterian.*

1333. Part of a tibia. The lower third, after having been enlarged by superaddition of new bone, has been penetrated, on its inner surface, by numerous close-set, large, and deep ulcers, chiefly of round and oval form, which have burrowed irregularly through the new bone and the subjacent shaft, nearly isolating some portions of it, and even passing through from one side to another. The parts thus ulcerated have, however, to a certain extent, healed: nearly all the bone bounding the ulcers is smooth, very hard, heavy and solid; some of the portions which remained between the ulcers, and under which they burrowed, appear also to have sunk-in and united to deeper parts. *Hunterian.*

Cancerous Ulceration of Bone.

1334. A skull in which nearly the whole of the bones of the left orbit, and of the left side of the nose, and large portions of the frontal and sphenoidal bones, have been destroyed by ulceration, consequent, probably, on the spreading of some malignant disease. The margins of the ulceration are irregular, sharp, and shelving; but the texture of the exposed and adjacent bone appears healthy.

Presented by Sir William Blizard.

1335. A tibia and fibula, with part of the bones of the tarsus. Just above the ankle-joint a portion of the fibula, upwards of two inches long, and including its whole thickness except a narrow band at the posterior part, has been removed by ulceration. The borders of the ulcer are irregular, but very abrupt and sharp ; the fibula above it is considerably enlarged, thickened with deposits of new bone upon its surface, and, both below and above the ulcer, firmly ankylosed to the tibia. The tibia is healthy, except that a small quantity of new bone has been formed on it near the seat of the ulcer of the fibula. The os calcis also has similar deposits, and is partially ankylosed to the astragalus.

From a man, aged 50. A pony kicked him on the seat of disease; ulceration followed, and ultimately assumed a cancerous appearance. The leg was amputated; but he died with diseased lungs a few weeks afterwards.

From the Museum of Robert Liston, Esq.

1336. The greater parts of a tibia and a fibula. On the anterior aspect of the tibia is an ulcer six inches long and two inches wide. It is of an oval form ; its margins are irregular, abrupt and sharp : its base is very uneven ; for in some parts it has extended through nearly the whole thickness of the shaft, in others it has destroyed only the inner wall. The remaining osseous tissue is in parts thickened, but in others appears healthy. The adjacent part of the tibia is enlarged, and a small quantity of new bone is formed on its surface. The fibula also presents similar formations on its surface.

The patient was a man 42 years old. The soft parts over the ulcer in the tibia had been for many years the seat of a fungating malignant-looking ulcer, and his general health was much impaired. The limb was amputated below the knee, and the head of the fibula was removed. Violent inflammation of the knee-joint took place, and was followed by profuse suppuration and hectic, with which the patient died.

From the Museum of Robert Liston, Esq.

1337. The upper part of a skull showing numerous circular ulcers, some nearly one inch in diameter. All have exposed the diploe; and several have perforated the inner

table of the skull. In these perforating ulcers the more superficial part of the bone is the most widely destroyed.

Death followed the exposure of the membranes of the brain. The ulcers were probably connected with cancerous formations.

Presented by Dr. Bowen.

Subdivision E. *Necrosis.*

General characters of the process: 1338 to 1423.
After experiments with actual cautery: 1338 to 1350.
Illustrations in Plants: 1351–2.
Separation of Periosteum in external Necrosis: 1354 to 1357.
Surrounding formation of new bone: 1115 to 1117, 1248, 1358 to 1361 A.
Formation of groove of separation or "line of demarcation": 1115 to 1118, 1120, 1248, 1362 to 1377, 1427.
Formation of Cavities containing Sequestra and of "Cloacæ": 1209, 1211, 1340 to 1350, 1385 to 1396, 1399, 1400, 1402–3, 1405–6, 1447, 1451, 1455, 1463, 1492.
Healing, with advanced or nearly completed formation of new bone: 1378 to 1380, 1432, 1434, 1450.
Changes in dead portions of bone: 1381–2.
Varieties of Necrosis.
According to situation: 1383 to 1406.
Complete or nearly complete: 1425, 1430–1, 1437–8, 1488, 1492 to 1496.
External: 1383 to 1390.
Middle: 1391–2.
Cancellous, or internal: 1393 to 1401, 1483 to 1485, 1555 to 1557, 1560–1.
Articular: 1402 to 1406, 1493, 1867, 1872.
Of diseased bone: 1122, 1304 to 1307, 1317, 1407 to 1411, 1429, 1436, 1443.
Recurrent or double: 1412 to 1415.
From special causes, local or general: 1304 to 1307, 1416 to 1423, 1440 to 1442, 1547.
Without suppuration: 1423 A.
Necrosis of the several Bones.
Bones of the Skull: 1249, 1251, 1304 to 1307, 1317, 1424 to 1436, 1362 to 1364, 1379–80, 1411, 1417, 1421 to 1423.
Bones of the Face: 1437 to 1449.
„ „ Trunk: 960, 968, 1450 to 1452, 1412.
„ „ Upper Extremity: 924, 944–5, 1453 to 1473.
„ „ Pelvis: 1382, 1384, 1402, 1475, 1878.
Femur: 1048, 1051, 1115 to 1117, 1129, 1130 to 1132, 1248–9, 1476 to 1490, 1354, 1357 to 1360, 1365 to 1367, 1391–2, 1399, 1406, 1420, 1423 A, 1867, 1872.
Patella: 1491.

Tibia: 1097–8, 1099, 1100 to 1102, 1120, 1122–3, 1209, 1210, 1492 to 1545, 1355–6, 1361, 1368 to 1370, 1378, 1383, 1385 to 1390, 1393 to 1398, 1400–1, 1403 to 1405, 1407 to 1410, 1413–14, 1416, 1418–19.
Fibula: 1546 to 1554, 1375–6, 1415–6, 1106.
Bones of the Foot: 1113, 1555 to 1573, 1338 to 1350, 1371 to 1374, 1381.

The following preparations (from No. 1338 to No. 1350) are described in the Hunterian MS. Catalogue as specimens of "exfoliation in consequence of death, produced by the actual cautery applied at different periods. All of them show that, round the dead bone, an additional bony matter was laid on the sound [bone]; or rather, that the soft parts round the dead bone became bony, and as the fungus [of granulations] was forming from these soft parts so as to close over the dead bone, so did this fungus form into a bone so as to enclose the dead part."

These preparations, which are followed by some exhibiting similar appearances in injured wood, are admirably adapted for the illustration of the general nature of the processes by which a portion of dead bone is separated, and its loss repaired; and they also exhibit a complete history of superficial necrosis, or the form of necrosis in which the dead portion includes at least as much of the outer surface of the bone as of its deeper substance. It appears to have been chiefly from them that Mr. Hunter drew the account of necrosis which, collected from his Lectures [*Works*, vol. i. p. 525], is here subjoined.

"Exfoliation," he says, "is the separation of the dead bone from the living." "When a piece of bone becomes absolutely dead, it is then to the animal machine as any other extraneous body, and adheres only by the attraction of cohesion to the machine. The first business of the machine, therefore, is to get rid of this cohesion, and discharge it. For effecting this separation there are several natural and successive operations going on."

"The first effect of the stimulus [produced by the dead bone] is on the surface of the living bone, which becomes inflamed; whether new vessels are formed, or the old ones become larger, is undetermined; but by injecting the surface of the part, it appears evidently much more vascular than the other parts. The surrounding parts also inflame, as the periosteum and cellular membrane, and often taken on ossific inflammation. This produces another process: first, absorption of the earthy matter, and all the surface between the living and dead parts of the bone becomes as soft as

if steeped in acid, while the dead part remains as hard as ever. To complete the separation, the absorbents continue their office, and absorb the living parts also, and the first process is in a small degree attended with the second." "The first appearance of separation is an alteration in the part round the exfoliating piece. This alteration is first a sponginess; next, its becoming fuller of little holes; then a small groove is produced, a kind of worm-eaten canal about the thickness of a shilling, becoming gradually deeper and deeper; and the depth is irregular, according to the extent of the original cause." But "the operation of separation does not take place equally; it begins at the circumference, and continues on to the centre; and before the centre has begun the absorption of the earth, the circumference has begun" the absorption of the animal substance of the bone.

Mr. Hunter further explains that while the separation between the dead bone and the living is going on, granulations are being formed from all the surrounding tissues that were inflamed, such as the periosteum, and cellular tissue, and that it often happens that, after some time, as these granulations grow from every side over the dead bone and are ossified, the sequestrum is "locked in at the edges" and appears like an internal exfoliation, being enclosed in a nearly complete cavity of bone. "When the dead part is wholly loose, it is, like all extraneous bodies, pushed up to the surface." . . "For from all that living bone adjacent to the dead piece, granulations arise, which push up the dead piece against the upper sides of the cavity [of bone in which it has been enclosed]; and in consequence of this pressure against the newly formed bone [of which the upper or outer side of the cavity is composed] the absorbents are set to work to remove it, and in proportion as this is absorbed, the dead piece is pushed out, the granulations filling the space behind it:" lastly, these granulations ossify and restore the size and strength of the original bone.

Mr. Hunter believed that, in the ordinary process of exfoliation, the separation was effected by the absorption of the surface of the living bone, and in evidence adduced this example. "If a circular piece is taken out of the skull, and the circular edge of the remaining bone has its life destroyed by the actual cautery, to any distance, this deadened part will separate and come away, which it might not be able to do without a loss of substance between the living and dead bone. Another proof of the loss of substance in the supposed case is, that the [outer] side of the circular piece which is separated will retain its spiculæ, while the edges of the remaining bone, so far from corresponding with them, are quite smooth. Now, as there is room in this circular hole to allow the ring of bone to come out, its regularity [that is, the regularity of the edges of the hole] cannot be the effect of new matter added between the spiculæ, but is in consequence of the absorption of those spiculæ."

Mr. Hunter added, "But I by no means wish to be understood that no absorption of the dead piece can take place; for, on the contrary, I believe that Nature sometimes finds it necessary to

the completion of her process; it generally takes place when the separation is slow, and the granulating process is quick." The only instance, however, which he adduces of the absorption of dead bone is that of the removal of the fangs of teeth which are about to be shed: and there is no proof that he believed more than that, in cases of necrosis, while the dead and living bone are still continuous, a part of the former may be absorbed before it is separated. In speaking of enclosed or encased exfoliations he does not mention the possibility of the size of the dead portion being diminished by absorption.

The preceding explanation of the usual consequences of necrosis is illustrated by the series of experimental preparations already mentioned, and by others immediately following them (from No. 1354 to 1382), which are arranged according to the stages of the process thus described.

Illustrations after Experiments with Actual Cautery.

1338. Section of the metacarpal bone of an Ass, from which a portion of the wall, including more of its surface than of its deeper substance, was in process of exfoliation after being cauterized. The separation of the living from the dead portion is indicated by a narrow groove extending from the surface to some depth between them and, deeper than this groove, by a thin layer of soft substance, by which the dead and living bone are held close together. New bone is formed on the margins of the living bone, beneath its periosteum. The wound through the soft tissues over the cauterized portion of bone is widely open; and its margins are formed of healthy granulations.

1339. The other section of the same metacarpal bone, macerated and dried. The dead portion of bone has completely separated in the maceration. The new bone forms a layer which extends, gradually decreasing in thickness, over the surface of the shaft for a considerable distance around the seat of exfoliation.

1340. Section of the metacarpal bone of an Ass, on which a similar injury was inflicted a longer time before the death

of the animal. The separation of the dead bone is complete. The ring of new bone formed around the sequestrum extends half an inch over its margins, enclosing it in a cavity which has a central aperture filled with granulations from the surrounding soft parts.

1341. A similar preparation obtained at a yet later period after the injury. The central space or aperture remaining in the new bone formed around the sequestrum, and converging over it, is smaller than that in the preceding specimen. A layer of soft granulations has arisen from the surface of the living bone beneath the sequestrum. The periosteum is reflected from an adjacent part of the shaft, exposing the outer margin of the circle of new bone.

1342. The metacarpal bone of an Ass exhibiting similar changes, after having been macerated and dried. The sequestrum is completely separated and lies loose in the cavity formed by the new bone, the borders of which have grown far over it on every side. The new bone is light and porous and extends over the surface of the shaft far beyond the seat of the exfoliation.

1343. A similar specimen, partially macerated. The new bone extends so far over the sequestrum that only a small aperture remains in its centre. By this aperture the cavity in which the sequestrum is enclosed communicates with a fistulous canal through the granulations from the soft parts. The new bone is much harder and more compact than in the preceding specimens, and its union with the shaft is more intimate.

1344. A preparation similar to No. 1340. The sequestrum has been removed, to display the vascularity of the walls of the cavity in which it was situated.

1345. The other section of the preceding metatarsal bone, macerated and dried.

1346. A preparation similar to No. 1344, in which is also shown a section of the vascular wall of the fistulous passage by which the cavity containing the sequestrum opens externally. The sequestrum lies in the bottle; its length is upwards of two inches, while the aperture into the cavity which contained it is not more than an inch in its greatest diameter.

1347. The other section of the preceding metatarsal bone, macerated and dried. The new bone has a compact texture and has entirely coalesced with the original shaft.

1348. Section of the metacarpal or metatarsal bone of an Ass, from which the exfoliation of a very thin piece of the surface of the wall has been completed. The cavity in which the sequestrum lay has been filled up with very hard and compact new bone, which has intimately coalesced with the remainder of the shaft, though, by the difference of its structure, the line whence the sequestrum was separated is still discernible. A process of the new bone has grown into the fistulous canal through which the cavity containing the sequestrum communicated externally. The wound through the integuments is nearly cicatrized.

1349. The other section of the same bone, macerated and dried.

1350. A similar specimen. The quantity of new bone formed is less; and the external wound has cicatrized. A well-formed periosteum is continued over the new bone from the adjacent part of the shaft.

Changes similar to Necrosis in Plants.

1351. Longitudinal section of a small branch of a tree, in which, after an injury intentionally inflicted, changes similar to those consequent on superficial necrosis of bone have been produced. A portion of the whole thickness of the bark,

of an oval form, was removed; and the superficial layers of the subjacent wood, having in consequence died, are separated by a distinct dark line from the adjoining living wood. Part of the new wood which was formed in the subsequent growth of the branch projects over the margins of the dead wood, so as to lock it in, in a manner similar to that in which the sequestrum is partially enclosed in some of the preceding specimens.

1352. Longitudinal section of a small branch of a tree, from which a ring of bark was removed, and in which changes similar to those shown in the preceding specimen, but more advanced, have taken place. On one side of the section the dead wood has completely separated; on the other its partial separation from the living wood is indicated by a dark line. New wood has been formed at both margins of the ring; but a greater quantity projects over the upper than over the lower margin. No union has taken place between this new wood and the surface of the dead wood over which it projects; but the bark has grown to the extremity of the new wood, and, at one part, is continued over its extremity to its inner surface.

Separation of the Periosteum in Necrosis of the Outer Surface of Bone.

1353. A section of the upper part of a child's tibia. The periosteum was completely detached, except close to the head, where it still remains adherent. The surface of the compact tissue shows no change; when fresh it was rather more than usually vascular.

The specimen shows some of the earliest changes in "acute necrosis." The child, about 12 years old, when in apparently good health, became suddenly ill with acute pain in the leg, acute fever and delirium. The leg became swollen; and an incision was made to the tibia at the most swollen part; but death ensued after about forty-eight hours' illness.

Presented by Sir James Paget, 1880.

1354. "A section of a femur which was amputated, with the periosteum separated, to show how clear the periosteum separates from the bone in inflammation; a fact almost always observable after amputation."—*Hunterian MS. Catalogue.*

The change which has taken place is, probably, the separation of the periosteum after necrosis of the extremity of the bone divided in amputation. The separation extends nearly two inches upwards.

1355. Part of the hind leg of a large Dog. Necrosis of the whole thickness of the lower three fourths of the tibia was produced by filling the medullary tube with lint. The periosteum is separated from the surface of the dead bone and is very vascular. No reparative process appears to have commenced.

From the Museum of Robert Liston, Esq.

1356. The right leg of an infant, with the knee- and ankle-joints. The knee-joint is exposed and the integuments are laid open by a vertical incision. The shaft of the tibia, excepting at its lowest part, is entirely bare and separated from its periosteum and upper epiphysis. A perforation, through which a brown glass rod is passed, runs through the outer part of the epiphysis, opening into the knee-joint beneath the outer condyle of the femur. The joint itself is otherwise healthy.

From a child 9 months old. A month before amputation the right knee became swollen, and the child became feverish and fretful. The swelling increased, extending down the leg, so that at the end of a week it was found necessary to make a free incision. Extensive necrosis of the tibia was then detected; free discharge followed, and the child was attacked with erysipelas of the affected limb. It became much exhausted, and amputation was performed, after which it made a very good recovery. The disease probably commenced between the epiphysis and the shaft, and was followed by periostitis. The perforation into the knee-joint must have occurred shortly before amputation. (See 'Transactions of the Clinical Society,' vol. ix. p. 175.)

Presented by George Brown, Esq., 1876.

1357. The lower half of a femur, with the knee-joint. A large

abscess-cavity surrounding the bone is laid open. In consequence of recent acute periostitis the superficial layer of the bone is bare and necrosed in some places; and a distinct groove of separation has formed around the necrosed portion. The periosteum in other parts is greatly thickened and vascular, as if in preparation for the formation of new bone. The epiphysis has completely separated from the lower end of the femur; and a layer of lymph covers the exposed surfaces of the epiphysis and the shaft. The synovial membrane of the knee-joint is thickened and vascular.

From a youth aged 16. Three weeks before his admission into hospital the disease commenced with pain in the right thigh and feverishness, not preceded by any local injury. The day after admission a large fluctuating swelling over the middle and lower part of the right thigh was opened; and much pus escaped; but no dead bone could be detected. A few days later the discharge became offensive, and effusion took place in the knee-joint with hæmorrhage from the wound. It was found necessary to amputate the thigh seven weeks from the commencement of the disease. Secondary hæmorrhage took place on the tenth day; but, although much exhausted and suffering from bed-sores, the patient ultimately made a good recovery.

Presented by John Hilton, Esq., 1866.

Formation of New Bone on the boundary of the Living part adjacent to the Dead.

1358. Section of the end of a femur after amputation. The end of the bone is not covered by periosteum, and (although its texture appears unchanged) it had probably perished. Above the uncovered part the periosteum and some of the adjacent tissues are thickened; and a thin layer of new bone is in one situation formed beneath the periosteum at the boundary of the part which is presumed to have perished.

Hunterian.

1359. A similar preparation. No groove has, in either of these specimens, been formed between the dead and living parts of the bone. *Hunterian.*

1360. Portions of a femur with necrosis which occurred after a compound fracture about six inches below the summit of the great trochanter. The necrosis has affected the extremities of both portions of the bone, but that of the lower portion to a much greater extent than that of the upper. The periosteum is separated from the extremity of the lower portion and loosely connected with the rest of it, except at the boundary between the dead and living parts. In this situation it is thickened and firmly adherent to some new bone formed between it and the surface of the shaft.

The patient was a boy 16 years old. The fracture was the result of a fall from a considerable height and was not well managed. A large abscess formed in the thigh; and after death the end of the lower portion of the femur was found drawn up to the sacro-sciatic notch.

From the Museum of Robert Liston, Esq.

1361. Section of a tibia, of which a considerable portion of the wall and some of the adjacent cancellous tissue suffered necrosis. The line of boundary between the dead and living portions is marked only by increased vascularity along the borders of the latter; no groove is formed. Above and below the dead portion large quantities of very vascular new bone have been formed between the periosteum and the surface of the shaft, and are connected by a narrow strip of new bone, which is in close contact with the dead portion of the shaft. The periosteum, a part of which is reflected from the surface of the new bone, is thickened and more than usually vascular. There are several deposits of a firm pale substance, like lymph, in those parts of the cancellous tissue which have not perished.

From a young person in whom the disease had existed between three and four weeks.

From the Museum of Robert Liston, Esq.

1361A. A portion of a femur after vertical section. Upon the posterior surface of the shaft in its middle third is a formation of new bone, rough on the surface, and about three quarters

of an inch in thickness at its most prominent part. The section has exposed one half of an elongated cavity in which lay a sequestrum derived from the outer or compact layer of the shaft. A small channel, indicated by a glass rod, leads from this cavity to the outer surface of the new bone. A slight amount of suppuration had taken place around the sequestrum, and had formed a small abscess in the abundant newly formed connective tissue by which the swelling around the shaft was much increased.

From a man aged 29 years, who had suffered with a painful tender swelling of the thigh for three months. This, to palpation, and even after an exploratory incision, so closely simulated a periosteal sarcoma that amputation at the hip-joint was performed.

Presented by Anthony A. Bowlby, Esq., 1882.

Formation of a Groove of Separation between the Dead and the Living parts of Bone.

1362. Portion of a skull, in which a large piece of the frontal bone perished in consequence of a blow. The texture of the dead bone is not changed; but at the margins of the living bone the apertures for blood-vessels are larger and more numerous than is natural, and an irregular but very shallow groove is formed. *Hunterian.*

1363. The upper part of a frontal bone, of which a considerable portion of the outer surface was in process of exfoliation. The dead portion has the mark of a blow on it, and is distinguished by its pale colour and clean polished surface; it is encircled by a broad shallow groove; and the surrounding bone is unnaturally porous from the enlargement of its vascular canals. *Hunterian.*

1364. Part of a frontal bone, a small portion of the outer surface of which was in process of exfoliation. The dead bone is not altered in appearance, but is surrounded by a broad shallow groove and by large apertures for vessels in the

adjacent living bone. The skull is fissured just below the dead portion.

The patient died some weeks after receiving a blow on the head. Soon after the injury a part of the scalp was reflected for the purpose of trepanning; but no fracture being discovered, the trepan was not applied. The exposed portion of the skull perished; and while its exfoliation was proceeding the patient died.

Hunterian.

In these specimens of necrosis of the skull the formation of the separating groove has not been preceded by the growth of new bone. The indisposition to the formation of new bone on their outer surface is a remarkable peculiarity of the bones of the skull: between their inner surface and the dura mater new bone is often formed.

1365. Section of the end of a femur, after amputation. Its extremity perished, and was charred by the actual cautery which was applied to accelerate its removal. It is separated by a broad and deep groove from the adjacent part of the shaft, around which a thick ring of new bone is formed. The cancellous tissue is healthy; and its surface is covered by a thin slough. *Hunterian.*

1366. The other section of the same part, macerated and dried.

Hunterian.

1367. Part of a similar ring of dead bone, completely exfoliated from a femur after amputation. It shows, as the preceding specimens also do, the irregularly jagged edges described by Mr. Hunter as existing in the portions of dead bone separated after trephining. [See page 257.] *Hunterian.*

1368. A transverse section of a tibia, from which a portion of the wall was in process of exfoliation. A narrow groove, filled with soft vascular tissue, separates the dead from the living bone: the texture of the former is unchanged; that of the latter is expanded and swollen. *Hunterian.*

1369. A left tibia, of which the whole of the shaft has suffered necrosis. The surface has a rough worm-eaten appearance. In some parts it has been coated with new bone. The groove, or commencing line of separation between the dead and living bone, is well marked at the lower end, about an inch and a half above the articular surface. No such line has yet been formed at the upper end.

From a man who, in consequence of a blow, suffered from inflammation of the leg, resulting in numerous profusely discharging ulcers, and necessitating amputation eleven months after the receipt of the injury.

Presented by Sir Stephen L. Hammick.

1370. Part of a tibia, on the posterior surface of which two portions of the wall have perished. They are distinguished by their smooth clean surfaces, and are surrounded by shallow grooves. The adjacent bone is more porous than is natural; and some new bone is formed on it. *Hunterian.*

1371. Part of an astragalus, from which the superior articular surface, having perished, was in process of exfoliation. A very narrow ulcerated line separates the greater part of the dead from the living bone; and the cancellous tissue beneath the line is more vascular than that in any other part.

Hunterian.

1372. A vertical section of the same astragalus, which, after having its blood-vessels injected, has been dried and suspended in spirit. The boundary between the dead and living portions appears wider than in the preceding specimen, in consequence of the shrivelling of the lymph or granulations by which it was filled. *Hunterian.*

1373. A similar section of the same astragalus. *Hunterian.*

1374. Another section of the same astragalus, macerated and dried. It shows, more clearly than the preceding sections,

how far the separation between the dead and living portions of bone had proceeded. *Hunterian.*

[It may be observed that these four specimens are very like those in Nos. 1270 to 1272, in which the vascularity and injection of the vessels of similar portions of an os calcis and astragalus, which were being separated by ulceration, prove that they had not perished. The portions nearly detached in these specimens are not injected; it is therefore almost certain that they had perished.]

1375. A section of the lower end of a fibula, from which a portion of the malleolus was in process of exfoliation. The dead and living portions of bone are separated by a deep groove on their outer surface. The exterior of the fibula above the exfoliation is superficially ulcerated, very vascular, and covered with new bone. *Hunterian.*

1376. The other section of the same fibula, macerated and dried. *Hunterian.*

1377. A portion of bone, with its investing soft parts, "to show the appearance of an ulcer over a bone which is exfoliating."—*Hunterian MS. Catalogue.*

Advanced or nearly completed Formation of New Bone: healing after Necrosis.

1378. Section of the tibia of a large Dog, in which necrosis of a portion of the anterior wall and of the adjacent cancellous tissue was artificially produced a long time before death. The dead bone, which includes the whole thickness of the wall and is distinguished by its dull white colour, is enclosed in a cavity lined with very vascular granulations. The anterior wall of this cavity (in which are one or more external openings) is formed by new bone, apparently produced, as in Mr. Hunter's experiments, from the walls of the shaft above and below the dead bone. The texture of the

new bone is vascular and spongy ; externally it is covered by an imperfect periosteum continuous with that of the original shaft, and internally is lined with granulations which are in close contact with the sequestrum. The other boundaries of the cavity are formed by the surfaces of the bone whence the sequestrum separated, all of which are lined by granulations. A large quantity of new bone is formed on every living part of the exterior of the shaft and, especially, opposite the sequestrum, where it forms a layer in some situations nearly half an inch thick. Its tissue is vascular and rather compact ; it is closely united with the exterior of the shaft, and is covered by the original periosteum thickened and more than usually vascular.

From the Museum of Robert Liston, Esq.

1379. The posterior part of a skull, from which a large portion of the parietal and occipital bones was separated, probably in consequence of necrosis. A portion of the right parietal bone, nearly two inches wide and including its whole thickness, has been separated, and, for a considerable distance around the aperture, the outer table and the diploe have been removed to various depths. The whole of the exposed surface is healed, and the edges of the aperture through the bone are smoothly rounded-off. *Hunterian.*

1380. The upper part of a skull, from which a portion of the whole thickness of the right half of the frontal bone was removed, after fracture or necrosis. The margins of the aperture, which is of an oval shape and nearly two inches in its greatest diameter, are smoothly rounded, shelving obliquely from without inwards. Some new bone appears to have been produced at the edges of the aperture in the inner table, by which its size is rendered considerably less internally than it is externally. The remaining aperture is closed by a tough membrane. *Hunterian.*

Changes in the Dead portions of Bone.

1381. "A great toe, the first bone of which had become dead. A soft covering for the end of the metatarsal bone has taken place to preserve the joint, as also on the end of the last or second bone, by which means the dead bone is perfectly enclosed. It has got out of the direct line between the two bones in its way to the skin; but it is half eat away by the surrounding granulations."—*Hunterian MS. Catalogue.*

1382. Portion of a humerus, about seven inches in length, which separated after necrosis. It includes the greater part of the inner layers of the wall, but none of the cancellous tissue. Its outer surface is everywhere rough and irregular, except in the upper part, where it is smooth, as if formed by the outer layer of the original wall. At this part a portion of the sequestrum, having protruded during life, was removed with cutting forceps. The remainder continued enclosed for a long time in the soft and granulating tissues around it; but the cut surface has undergone no change, and an incision made by the end of the blade of the forceps, where it did not cut completely through the bone, still looks as if it had been made recently.

From the Museum of Robert Liston, Esq.

Varieties of Necrosis according to situation.

Necrosis chiefly Peripheral or External; affecting portions of the superficial and portions of the deeper layers of a bone; generally with separation of portions of living bone with the periosteum.

1383. Part of a tibia from a case of compound fracture. The periosteum is thickened, and, with parts of the superficial layers of the bone adhering to its inner surface, is separated for several inches above the fractured extremity. At its broken end the whole thickness of the shaft has suffered necrosis; above this part its surface presents shallow excavations which exactly correspond to the portions of bone separated with the periosteum. *Hunterian.*

1384. Section of the radius of a Dog in which extensive necrosis of the walls was produced by the introduction of a foreign body into the medullary tube. The dead bone comprises, in nearly two thirds of the length of the shaft, the whole thickness of its posterior wall and the greater part of the thickness of its anterior wall; the cancellous tissue of this part was destroyed in the experiment. On the posterior part of the bone (on the left-hand side of the preparation) new bone has been formed on the surface of those portions of the shaft which survived above and below the sequestrum. On the rest of this part no new bone has been formed; but the periosteum, which separated from the surface of the shaft, is very vascular and lined with florid granulations. On the anterior part of the bone where, as already stated, the sequestrum does not comprise the whole thickness of the wall, a complete wall of new bone, nearly a quarter of an inch thick, has been formed by the growth (it may be assumed) of that portion of the outer layers of the original shaft which survived and separated with the periosteum. This new wall is connected above and below with the old one; its tissue is spongy and vascular; it is lined by florid granulations which are in close contact with the dead bone, and, externally, is covered by the original periosteum thickened and more than usually vascular.

From the Museum of Robert Liston, Esq.

1385. Sections of the tibia of a Dog, into the medullary tube of which, after the removal of a considerable portion of the periosteum, a red-hot wire was introduced several weeks before death. Part of the shaft has perished in its whole thickness; but at the extremities of the bone both the wall and the cancellous tissue have retained their vitality. A new bony case has been formed around the greater part of the dead bone. The exterior of this case is firm and compact, its interior is spongy and vascular and lined by a soft and very vascular membrane. At the parts from which the periosteum was removed no new bone has been produced. The original periosteum is continued over the new bone from the uninjured extremities of the shaft.

From the Museum of George Langstaff, Esq.

1386. Section of the tibia of a Dog in which necrosis was produced by thrusting a foreign body into the medullary tube. The sequestrum measures about three inches in its greatest length. It appears to comprise in some parts the whole thickness of the wall; but all the visible part of its outer surface is rough. New bone has been produced, forming a new wall, which is complete except at the part where the original wall was perforated for the introduction of the foreign body. The cancellous tissue of the original shaft, which was not destroyed by the experiment, is firmer and more dense than usual; the compact tissue is thickened, spongy and covered with new bone.

From the Museum of Robert Liston, Esq.

1387. Section of the tibia of a Dog, in which necrosis of a portion of the cancellous tissue and of the anterior wall was produced by the introduction of a foreign body into the medullary tube. The sequestrum, suspended by the side of the tibia, is between two and three inches long, half an inch wide, and consists of a portion of the wall, including parts of its outer layers. The cavity which contained the dead bone is lined with a thick layer of firm and vascular granulations, and is complete except at the part where the wall of the original bone was perforated, and where there is a small aperture. The anterior wall of this cavity, in which is the aperture just mentioned, is formed by a layer of new bone half an inch thick, continuous with the sound shaft above and below. The posterior wall is formed by the remains of the original shaft, thickened and expanded, and having spongy and very vascular new bone on its outer surface. The periosteum surrounding the new bone is thick and vascular, but is continuous with that investing the uninjured extremities of the bone.

From the Museum of Robert Liston, Esq.

1388. A tibia, of which a great part of the wall of the shaft suffered necrosis. New bone has been formed around nearly the whole of the shaft, and is invested by a thick periosteum continuous with that surrounding the extremities of the

original wall. There are several apertures in the new bone. Opposite the two largest of these the exposed surface of the dead bone is smooth, being formed by the outermost layer of the wall of the tibia. At the junction of the shaft with its superior epiphysis several ulcerated apertures lead into deep cavities.

The patient was a boy who had suffered with the disease for several months. He recovered after amputation.

From the Museum of Robert Liston, Esq.

1389. A tibia, of which nearly all the anterior and posterior walls of the shaft suffered necrosis. The dead portion is surrounded by an irregular deep groove ; and its anterior part is perforated by numerous small apertures, through which the cancellous tissue appears more than usually vascular. A large quantity of new bone has been produced. The case which it forms is incomplete at the anterior and inner part, where the outer layers of the original wall perished, and is continuous at the outer part with that portion of the wall of the original shaft which survived. A periosteum invests all the new bone, and is continuous with the periosteum surrounding the epiphyses and the surviving portion of the shaft, as shown at the back of the preparation. Near the union of the shaft with the epiphyses are several small round apertures, some of which pass through the new bone. The superior internal articular surface of the tibia and the cartilage covering it are perforated by a small round aperture with smooth edges, through which pus escaped from the head of the bone into the knee-joint.

The necrosis was of six months' duration. The knee-joint, after amputation, was found full of pus.

From the Museum of Robert Liston, Esq.

1390. A tibia and fibula macerated and dried. A large portion of the tibia, comprising nearly the whole of its anterior and inner walls and the upper and lower parts of its posterior wall, suffered necrosis. A considerable quantity of new bone has been formed around the dead shaft ; but, as in the

preceding specimens, there is no new bone opposite any of the parts at which the exposed surface of the dead bone, formed by the outer layers of the wall, is smooth.

From the Museum of Robert Liston, Esq.

1390 A. The lower third of a femur with excavations at three points on its posterior surface. They were due to necrosis ; and the upper cavity contains a sequestrum ; the lower cavity, just above the articular surface, has penetrated to the anterior surface of the bone.

Presented by Sir William Fergusson, 1875.

1390 B. A section of a metacarpal bone of a Calf. The lateral surface of the upper third is much thickened by the formation of new bone, beneath which is an elliptical cavity communicating by a channel with the surface. The cavity may have resulted from the formation of new bone after necrosis of a portion of the superficial layer of the bone.

Presented by Samuel G. Shattock, Esq., 1881.

Necrosis of portions of the Middle or Inner Layers of the Wall of a Bone.

1391. Vertical sections of the middle of the shaft of a femur, exhibiting a small cavity in its anterior wall, from which it is probable a sequestrum has been removed. The front boundary of this cavity is covered with new bone and opens externally. The adjacent parts of the shaft are enlarged and increased in density ; and new bone, like that formed in syphilitic ulceration, has been produced on all parts of their surface. *Hunterian.*

1392. Portion of the lower part of a femur, of which the walls are slightly thickened and made irregular by the formation of new bone upon their external surface. On the anterior part of the bone is a round aperture, about two lines in diameter, leading to a very small dead piece of the inner

part of the wall and the adjacent part of the cancellous tissue.

From a woman 50 years old. A large abscess formed on the front of the thigh and, after communicating with the bursa above the knee-joint, opened externally. Profuse discharge ensued and the patient became hectic. Amputation was performed and she recovered.

From the Museum of Robert Liston, Esq.

Central or Internal Necrosis.—Necrosis of Cancellous Tissue.

1393. A vertical section of the lower half of a tibia, exhibiting necrosis of a large portion of the cancellous tissue and of the centre of its articular surface. In this section the lowest part alone of the dead bone remains. A bristle is passed through it; and it is further distinguished by the peculiar aspect of its lamellæ, from which, without any apparent change in themselves, the medullary membrane has been removed, as from a bone macerated after death. The dead bone is surrounded by a layer of soft vascular granulations formed in the adjacent cancellous tissue. A cavity, lined by similar granulations, extends for more than three inches up the interior of the shaft; within this cavity the remainner of the dead bone was enclosed. The wall of the tibia is thickened, and its external surface is irregular.

Hunterian.

1394. Another section of the same tibia, including the remainder of the dead and separated cancellous tissue. Bristles are passed into the cavity containing the dead bone, through several fistulous canals in the wall, which is in every part thickened, spongy and more than usually vascular.

Hunterian.

1395. Section of the lower part of a tibia, in which a portion of the cancellous tissue, with a small piece of the adjacent wall, suffered necrosis and is partially separated. The cavity containing the dead bone, together with a wide

channel leading through the wall of the shaft, have, for distinctness' sake, been painted dark brown.

From the Museum of Sir A. P. Cooper.

1396. Part of a tibia, in which necrosis has affected a portion of the cancellous tissue near its lower extremity. The dead bone lies loose in a large cavity within the shaft, which opens by several wide orifices through the walls, and through the articular surface into the ankle-joint. The whole of the articular surface is destroyed. The wall of the bone around the cavity is thin, light and porous; above it the walls are thickened and indurated, and appear as if there had been a large ulcer of the soft parts on the front of the leg. *Hunterian.*

1397. A portion of cancellous tissue, separated, after necrosis, from one of the extremities of the tibia of "a strumous girl." *Presented by J. Moore, Esq.*

1398. A thin section of the bones of a knee-joint. The cartilages and part of the articular surfaces of the bones have been completely destroyed; the tibia is slightly displaced backwards; and the patella is firmly united to the femur by bony ankylosis. The contiguous extremities of the femur and tibia are connected by bands of organized lymph. A large irregular portion of the cancellous tissue of the head of the tibia has suffered necrosis and is partially detached from the living bone.

Presented by Samuel Solly, Esq., 1866.

1399. Part of a femur, in which a compound fracture occurred just above the condyles. A portion of the cancellous tissue perished, and is contained in a large cavity between and behind the ends of the bone. This cavity has vascular walls and an external opening through a fistulous passage above the inner condyle. The ends of the fractured bone are rounded and smooth; but no process of union has taken place. *Hunterian.*

1400. Parts of a tibia and fibula. There has been necrosis of a portion of the cancellous tissue of the head of the tibia. All the upper part of the shaft is enlarged, and its exterior is thickened, irregular, and covered with spongy new bone. On its surface are three large apertures, which lead into a cavity occupying nearly all the interior of the head of the bone. By the side of one of these apertures a portion of the compact tissue appears to have been fractured, driven inwards and partially reunited. The exterior of the lower part of the shaft is slightly thickened and rough.

These changes were the consequence of a fracture of the tibia. Amputation was performed below the knee; and the cavity in the head of the tibia was sawn across. On the tenth day after the operation hæmorrhage from the stump took place. The blood was found to proceed from the part of the cavity in the tibia which had been left. This was therefore filled with lint: the hæmorrhage did not recur, and the union by granulation proceeded favourably.

From the Museum of Robert Liston, Esq.

1401. The lower end of a tibia enlarged and with its texture rarefied and very light. A great part of the cancellous tissue is necrosed and almost separated from the rest of the bone. The wall of the tibia is covered with light new bone, and presents several large openings into the cavity containing the dead bone. The articular surface of the ankle-joint is healthy.

Necrosis of Articular portions of Bones.

1402. The extremity of a thumb, divided vertically. The distal phalanx, separated after necrosis, lies in a cavity surrounded by granulations, part of which separate it from the articular surface of the proximal phalanx. "The joint was thus prevented from communicating with the dead bone, which might therefore have been removed without opening the joint or hurting the second bone."—*Hunterian MS. Catalogue.*

See also No. 1381, and the Hunterian description of it at page 270.

1403. The upper end of a tibia, in which there has been necrosis of a small portion of the cancellous tissue and of the compact articular surface over it. The dead bone is contained in a cavity lined with a thin soft membrane, from which it has been pushed for a short distance upwards into the knee-joint. The corresponding half of the articular surface of the tibia is destroyed; its cartilage is removed, and the bone covered with a thin layer of granulations; but the other half of the articular surface is sound. *Hunterian.*

1404. The lower extremity of a tibia, from the articular surface of which a thin plate of bone has been exfoliated. The dead bone is now artificially attached to the part from which it separated. All the surrounding cartilage has been removed by ulceration. *Hunterian.*

1405. A knee-joint in which there is a small loose portion of cancellous tissue, separated from the middle of the head of the tibia. The dead bone rests in the cavity from which it was separated, and of which the walls are smooth and appear partially lined with a tough membrane. All the articular cartilages have been removed by ulceration; the borders and surfaces of the bones are nodulated and, for the most part, covered with tough fibrous tissue. In the lower part of the external condyle of the femur is a depression corresponding with the sequestrum separated from the tibia. The patella is united by fibrous tissue (which has been partially divided) to the external condyle of the femur.

Presented by Sir William Blizard.

1406. A vertical section of a knee-joint. A portion of the external condyle of the femur, about three fourths of an inch in diameter and including part of the articular surface, having suffered necrosis and been separated, lies in the cavity of the joint, loose but partly imbedded in the deep cavity remaining, after its separation, in the lower part of the condyle. The surface of this cavity is quite hard and smooth, like that of bone subjected to friction, and is slightly grooved in the direction of the motions of the joint.

All the articular cartilages have been removed; the exposed surfaces of bone are rough and nodulated; the synovial membrane is thickened, and at the anterior part a prolongation of it with a mass of adipose tissue has grown far into the joint. *Presented by Sir William Blizard.*

Necrosis of Diseased Bone.

1407. A tibia, from which a large piece of the middle of the anterior wall has been exfoliated. The sequestrum has an aperture in its centre, and is porous and uneven from the effects of inflammation and ulceration previous to its necrosis. A small sequestrum is partially separated from the posterior part of the tibia; and there is a large aperture in its wall near the tuberosity. The remainder of the shaft is covered with irregular deposits of new bone. *Hunterian.*

1408. Part of a tibia, from the anterior surface of which a thin oval portion of the wall was exfoliated, after being ulcerated and irregularly thickened. The borders of the shallow cavity left after the exfoliation are bounded by healthy new bone, beneath a part of which are two small sequestra, the separation of which is not completed. *Hunterian.*

1409. The portion of dead bone separated from the tibia last described. *Hunterian.*

1410. Part of a tibia, of which a large portion, including its lower articular surface, has been nearly separated after necrosis. Previous to its death, the portion of bone was deeply and irregularly ulcerated, the inferior and external articular surfaces being destroyed and only a small portion remaining of the internal malleolus. The greater part of the adjacent wall of the shaft also has been removed by the extending ulceration. *Hunterian.*

1411. The upper part of a skull from which, in the course of

syphilitic disease, a large portion of the frontal and parietal bones of the right side, after being tuberculated and deeply ulcerated, suffered necrosis and were exfoliated. The remaining portion of the skull is thickened and greatly increased in weight; the sutures are obliterated; and the diploe is replaced by compact heavy bone. It is, also, deeply and irregularly ulcerated on the greater part of both its surfaces, and in many situations the ulceration has perforated both the tables; but there is less ulceration on the inner surface of that portion of the skull from which the exfoliation has taken place than on any of the adjacent parts. The dura mater, of which the greater part is reflected from the interior of the skull, has several small portions of bone adherent to its outer surface.

From the Museum of Robert Liston, Esq.

Double or Recurrent Necrosis.

1412. The upper part of a sternum, with parts of the clavicles and of the first pair of ribs. A portion of the sternum nearly an inch in its greatest diameter, and situated close to the articulation of the right first rib, has perished and is almost separated by a deep groove from the bone around it. This surrounding bone is rough and spongy and, at the distance of about half an inch from the sequestrum just described, is separated by a shallow groove from the adjacent healthy bone. It therefore seems that after the necrosis of the portion first described, and its nearly complete separation, a second portion, in the form of a ring around the first, perished and was in process of separation when the patient died.

The patient was an old man; and there was an abscess in the anterior mediastinum.

From the Museum of Robert Liston, Esq.

1413. A tibia, of which a considerable portion of the shaft suffered necrosis. About two inches above the ankle-joint, the lowest limit of the dead bone is marked by a deep groove

which surrounds it and has nearly separated it; but higher up, especially on the anterior aspect, the division between the dead and living bone cannot be clearly traced. On the inner aspect, the necrosis extends to within two inches of the tubercle of the tibia; and here, also, it appears as if one portion of the bone had perished some time before the other; for within the outermost groove, which bounds the whole of this part of the dead bone, is another enclosing only a portion of the spine of the tibia, and beyond which a part of the dead shaft had at some earlier period been covered with new bone. New bone has, also, been deposited on the surface of all that part of the shaft which did not perish.

Presented by Sir William Blizard.

1414. Two sequestra, exfoliated from the front of a tibia. The larger sequestrum consists of a portion of the outer layers of the shaft thickened, increased in density, and partly covered with new bone. In its centre is a circular aperture with smoothly rounded borders, immediately beneath which, and exactly adapted to a cavity in its under surface, the smaller sequestrum lies. It is probable that a portion of the inner wall of the tibia, comprised in the smaller sequestrum, first suffered necrosis and, exciting inflammation, gave rise to thickening and other changes of the bone around it, as well as to the ulceration of the bone immediately over it; of which ulceration the effects are seen in the fistulous opening through the centre of the larger sequestrum, and in the shallow cavity on its inferior surface. The larger sequestrum must have perished and separated after these changes had taken place; probably its necrosis was the result of its being exposed by ulceration of the soft parts over it.

Hunterian.

1415. A sequestrum from a fibula, with the new bone which had formed around a portion of it and exfoliated with it after secondary necrosis. *Hunterian.*

Necrosis from Special Causes, either local or general.

1416. A tibia and fibula, in which necrosis, with sloughing of the foot, ensued in consequence of obstruction of the circulation by a popliteal aneurism. The dead portion of the tibia includes the external malleolus, all the inferior articular surface, and a piece of nearly the whole thickness of the shaft about four inches long. The dead is separated from the living bone by a broad superficial groove, and is in several situations covered with a thin layer of new bone. The rest of the shaft, nearly as far as the tuberosity, is covered with new bone. In the fibula a portion of the outer part of the shaft, extending about three inches above the malleolus, perished. The dead bone is encompassed by a groove, which passes through a layer of new osseous matter formed on part of the bone in an earlier period of the disease. A similar layer of new bone covers nearly all the remainder of the shaft.

The patient had a large popliteal aneurism. His foot mortified and dropped off, and the lower ends of the tibia and fibula were exposed; but he died before the separation of their dead portions was completed. The femur of the same patient, of which a large portion of the lower end was destroyed by the pressure of the aneurism, is preserved in No. 1253.

Hunterian.

1417. Portion of a parietal bone, from the posterior inferior angle, with a small piece of the occipital, which became necrosed and exfoliated after a lightning-stroke. The greater part of this sequestrum consists of the outer table and the greater portion of the thickness of the diploe, not including the inner table; but at the lower part the whole thickness of the skull is included. The sequestrum was sawn across the middle to effect its removal; but the two pieces have been cemented together.

The man was on board ship. The lightning appeared to pass through his body, scorching his hair and stunning him; but he recovered from the shock, suppuration ensued, the bone separated, and he recovered.

MS. Notes, vol. i. p. 289.

Presented by Dr. Simpson, 1871.

1418. A tibia, fibula, and astragalus. The tibia exhibits appearances consequent on necrosis of a large portion of its wall. The superficial layers of nearly the whole of the anterior part and of considerable portions of the posterior and inner parts of its walls have perished. The extent of the dead bone is marked by a shallow groove, about a line in width, completely surrounding it and separating it from those parts of the wall which did not perish. The surface of the latter is thinly covered with spongy, grey, new bone. Near the epiphyses the walls of the tibia are ulcerated. Its articular surface at the ankle-joint is also ulcerated, nearly all the layer of compact tissue being removed. There are similar appearances of ulceration on the corresponding surface of the astragalus ; and part of the inner wall of the fibula is thickened and spongy.

The patient was a boy twelve years old, who had severe phlegmonous erysipelas of the leg, which had been neglected before his admission into the Edinburgh Royal Infirmary. Extensive abscesses formed, with sloughs of the cellular tissue; and, his health declining, amputation was performed.

From the Museum of Robert Liston, Esq.

1419. A tibia, fibula, and patella, with part of a femur. Several portions of the external wall of the tibia, some of which are of large size, have suffered necrosis and were in process of exfoliation, grooves of various depths having formed around them. The intervening portions of the wall are rendered uneven by irregular deposits of new bone ; and near the epiphyses the walls are deeply ulcerated. Extensive ulceration has also taken place in the knee-joint; and the greater parts of the articular surfaces of the femur, tibia, and patella have been removed.

These changes occurred in a case of acute phlegmonous erysipelas of the leg with suppuration and sloughing of the cellular tissue.

From the Museum of Robert Liston, Esq.

1420. Part of a femur, in which the lower fourth of the shaft, after necrosis and ulceration, has separated, in maceration,

into numerous fragments of various size. The largest fragment is nearly four inches long, and consists of cancellous tissue surrounded by part of the original wall thinned and made rough by ulceration ; the other fragments are very small. The condyles have separated into several pieces ; but their articular surfaces are unaltered. The end of the part of the shaft at which this destruction was limited is irregularly ulcerated, and covered with new bone ; the rest of the shaft appears healthy.

From a scrofulous girl. It is most probable that this specimen shows the effects of necrosis in diseased bone ; but it is possible that the part of the bone reduced to fragments was involved in the growth of some large tumour.

From the Museum of R. B. Walker, Esq.

1421. A skull in which, in the course of syphilitic disease, large portions of the superior maxillary and palate-bones, as well as the whole of the vomer, were destroyed. There is a large irregular hole through the middle of the palatine portions of the superior maxillary bones ; and one of smaller size exists in each of the same portions of the palate-bones. The parts of the maxillary bones which form the anterior walls of the nose suffered necrosis ; and a portion of each, of the same form and size, is separated by a deep groove from the adjacent bone. The alveolar border did not entirely perish ; but on the right side only a thin layer of it remains. All the incisor teeth are absent ; but those of the right side must have been removed long before the necrosis occurred, for their sockets are closed and a great part of the alveolar border has been absorbed.

From a man twenty-four years old, who died with syphilis.

From the Museum of R. B. Walker, Esq.

1422. A lower jaw, portions of which have suffered necrosis, in consequence, probably, of the use of mercury. The dead portions are of the same form and size on each side. They extend, in length, from the bases of the coronoid processes to the sockets of the first two bicuspid teeth, and, in depth,

to within a quarter of an inch of the lower margin of the jaw. The separation of each is nearly completed at the outer and anterior part, but at the inner part has made little progress. The adjacent parts of the jaw are roughened by superficial deposits of new bone.

From the Museum of Joshua Brookes, Esq.

1423. A lower jaw-bone, the greater part of which is discoloured and porous. At several points, especially about the symphysis and over the rami, its surface is covered with a thin layer of light, spongy new bone. Many of the alveolar processes are superficially ulcerated; and the incisor, left canine, and three left molar teeth are missing.

From a man aged 35, who had been engaged in lucifer-match-making for twenty-three years. Though a hard beer-drinker, he had enjoyed very good health. Nine years before death he first noticed stiffness about the left side of the jaw with severe paroxysmal pain, which was worse in wet weather. Several of his fellow-workmen were at the time suffering from lucifer-match-maker's disease; but he attributed the pain in his jaw to rheumatism. Five and a half months before death he suddenly became unable to use his lower jaw, great swelling appeared over both sides, and a large abscess formed. He died of pyæmia. (See Trans. Path. Soc. vol. xx. p. 281; and MS. Notes, vol. i. p. 166.)

Presented by T. Blizard Curling, Esq., 1868.

Other specimens of Necrosis from Special Causes are: Nos. 1430, 1440, 1441.

Necrosis without Suppuration.

1423 A. A section of a femur, of which the whole of the compact layer, except on the posterior surface of its upper half, has undergone necrosis without suppuration, and is separated, but still remains continuous with the cancellous tissue at the upper and lower extremities of the shaft. The sequestrum is surrounded by a moderately thick layer of new bone; and at that part of the shaft where necrosis has not taken place the wall of the bone is much increased in thickness and is porous. Just above the middle of the shaft is a transverse fracture, around which is a considerable heaping-up of new bone; the medullary canal of the lower fragment is closed, but there is no osseous union.

From a man, aged 20 years, whose thigh was amputated at the hip-joint. He was quite well until ten weeks before his admission to hospital, when he began to suffer from pain and swelling of his left thigh. About four weeks later the limb suddenly gave way as he was walking across a room, and he fell. On examination the extremity was found much shortened in consequence of a fracture of the femur in its middle third. On making a section of the limb after amputation, performed five or six weeks after the fracture, no inflammation of the integuments or of the muscles, no abscess or sinus were found, nor was a drop of pus visible.

The other half of the femur is in the Museum of St. Bartholomew's Hospital, No. 167. (See Med. Chir. Trans. vol. lx., 1877.)

Presented by W. Morrant Baker, Esq., 1882.

Necrosis of the several Bones.

Bones of the Skull.

1424. Nearly half the frontal portion of an os frontis, which separated after necrosis consequent on injury.

The patient was a boy about four years of age, who fell from the back of a horse upon the stone pavement, and severely lacerated the scalp covering the upper and fore part of the head. An attempt at re-union of the wound failed; and inflammation and considerable suppuration followed the accident. The child, who appeared well at the time he received the injury, was seriously ill for a week: the wound did not heal till, at the expiration of six months, the portion of bone here preserved was removed. Complete recovery followed.

Presented by William Pretty, Esq.

1425. Part of a skull, from which the left temporal bone separated after necrosis. The trunks of the fifth and facial nerves, the principal divisions of the former, the remains of the Casserian ganglion, and the nerves proceeding from it, are dissected from the diseased mass in which they were involved.

The following is from an account of the case by Mr. Swan in his 'Treatise on Diseases and Injuries of the Nerves' (London, 1834), p. 291:—

William Sharp, eleven years of age, had a purulent discharge from the left ear, which began in the spring of 1824, kept gradually increasing, and became very offensive.

About the end of March 1825, the integuments around the ear became swollen and painful, and the whole side of the face was enlarged. At this time the discharge was very copious and offensive; he had frequent pains in the head and over the left eye. On passing a probe into the meatus, the bone was found to be denuded: his health had declined. In December it was observed that the left side of his face was nearly paralytic; he had violent pains in the head and face, which were much aggravated at night, and for which he took an opiate, with some relief. He was frequently drowsy, and sometimes nearly comatose. In February 1826 there was some inflammation of the conjunctiva of the left eye, which went off in a few days. On the 12th of October the left temporal bone appeared to be quite loose in the wound, and was easily extracted. About a week before this time his right eye became amaurotic; the pupil was dilated, and the lids closed. On the 14th he became insensible, but cried out when touched. On the 16th a large vesicle was formed at the inferior part of the left cornea; and the greatest part of the cornea had become opaque. The right cornea was not altered. He had slight convulsions; and when the left side of his face was touched he flinched. He died in the night.

He walked about until the last few days. He had generally a good appetite. His food appeared to digest properly; and, indeed, all the functions of the viscera of the chest and abdomen were perfectly performed. He could talk distinctly. The left side of his face was nearly paralytic; and the left side of the nose was completely drawn to the right side. When he cried out so as to exert the muscles of the face much, it was observed that those of the right side had very great power over those of the left; but the mouth, when shut, appeared even, and would not then have been supposed to be paralytic. From the end of March 1825, the pain in the right side was very severe, he shrieked very much, and the opiate did not relieve him. His manner became altered, and he was unwilling to answer questions. He was generally easier in the day, and spent much of it sleeping in the sun.

Examination.

This took place on the 17th of October, at 11 A.M. The dura mater was rather more vascular than is usual. The arachnoid membrane was much thickened, and especially on the right side; and there was much fluid between it and the pia mater. The pia mater was very vascular. There was much fluid in the lateral ventricles. The portion of brain which lay over the part from which the temporal bone was separated was protruded into a hernia, and the inferior cornu of the lateral ventricle was thereby drawn out of its course: the brain at this part was softer than natural; but the rest of it was sound. The origins of the nerves were distinct.

The third branch of the fifth pair was in a state of ulceration, near its beginning from the Casserian ganglion; the gustatory,

dental, and buccal nerves were, however, quite attached to it, and, indeed, did not appear to have suffered.

The auditory and facial nerves terminated in a bulbous mass on the dura mater. The facial nerve could with difficulty be traced in the face near the edge of the jaw, on account of the inflammatory process which had been going on there. It could, however, be distinctly seen to communicate with the dental nerve, and then terminate in a confused mass, which formed the walls of the cavity containing the exfoliating bone.

The par vagum, the glosso-pharyngeal, and the accessory nerves were sound, and passed just behind the walls of the same cavity.

The internal carotid artery, from above and below, could be traced as far as the walls of the cavity, and was then lost. It was reduced to a small size, however, before it reached the walls of the cavity, and was impervious.

The superior cervical ganglion of the sympathetic nerve terminated in the walls of the cavity. The branches given off from the sixth, which usually go to the superior cervical ganglion, were very small, and terminated with the internal carotid; the superior cervical ganglion itself appeared natural.

The vidian nerve was perfect from its connection with the spheno-palatine ganglion. The superior branch could be traced to a short distance, but soon became much smaller than usual: the inferior branch could be traced a little way; it then became very small; and the branches from the sixth could be traced the same distance; and both of these terminated with the internal carotid artery, in the walls of the cavity.

The condyloid process of the lower jaw was exfoliating. The whole of the temporal bone had exfoliated; and, to compensate for it, the orbital plate of the frontal bone had become unusually thick, and all the bone in the neighbourhood of the disease had a firmer texture than is observed at his age. The pericranium round the opening at which the hernia protruded was much more vascular than in the other parts.

A considerable portion of the brain had protruded, like a fungus, into the cavity left by the exfoliated bone; it had been forming gradually, and was, no doubt, the cause of his death.

The quantity of fluid contained in each ventricle was the same: and therefore the blindness of the right eye did not depend on this as its cause; for vision remained in the left after the right one was blind.

In the examination, a black pin was found in the cavity which had contained the exfoliated bone. Pins had not been used to confine the dressings: the question therefore is, whether it had been forcibly introduced into the ear, and occasioned the disease; but this could not be ascertained.

It will be seen from this very curious case, that the sympathetic may be partly destroyed and the general health remain unimpared, as we have a right to presume after a due consideration of all the circumstances which have been related. We may conclude there-

fore that, although the sympathetic nerve produces a general sympathy in the body, yet each ganglion has a somewhat local influence, inasmuch as it more particularly connects the parts giving and receiving branches from it, so as to associate them in complicated operations. Both the spheno-palatine ganglion and the Vidian nerve were first of their usual size; then each branch of the Vidian was diminished. Can it be presumed from this that the branches of the Vidian are going to, and not coming from the sympathetic nerve?

The functions of the facial nerve must have been entirely suspended; and, from the evenness of the mouth when at rest, and from his ability to speak so well, I cannot help concluding that the branches of the fifth had very considerable power in exciting the action of the muscular structure of the lips.

Presented by Joseph Swan, Esq.

1426. The lower part of the parietal bone, with the subjacent dura mater, and a portion of brain from the child whose case is just related. This portion of the brain is protruded below the edge of the bone, through an ulcerated aperture in the dura mater which lined the squamous portion of the temporal bone. *Presented by Joseph Swan, Esq.*

1427. The upper part of a skull. A large portion of the outer table of the frontal bone appears to have suffered necrosis shortly before the death of the patient. It does not differ in texture from the rest of the bone, but is surrounded by a shallow ulcerated groove; and around the groove the apertures for vessels passing into the bone are unnaturally large.

1428. The upper part of a skull in which a portion of the external surface of the left parietal bone was in process of exfoliation. The same appearances are presented as in the preceding specimen. A portion of the skull in the situation of the dead bone has been removed with a trepan.

Hunterian.

1429. A skull from which nearly half the superior portion of the occipital bone, and a large piece of the posterior part of the right parietal bone, separated after necrosis. One large

sequestrum is preserved. The remaining portion of the occipital bone, all the lower half of the right parietal bone, and the mastoid portion of the temporal bone are superficially ulcerated on both their surfaces. In several situations the ulceration has spread through these bones, producing small perforations of the skull; and they are surrounded by an ulcerated groove, indicating that all the superficially ulcerated bone had perished. The posterior part of the right squamous suture is included in the ulcerated groove.

The history of this case is unknown; but a trephine has been applied near the posterior and superior angle of the right parietal bone, and near this situation the skull is, for a short distance, fissured. It is probable therefore that, after some injury, acute ulceration of both surfaces of the bone ensued, attended by suppuration between the bone and the pericranium and dura mater, the necessary consequence of which was necrosis of that part of the skull from which the membranes were separated.

Presented by Sir William Blizard.

1430. A skull from which nearly the whole of the left parietal bone, with adjacent portions of the frontal and occipital bones, exfoliated after a burn. During the fifteen years which the patient lived after the exfoliation, a small quantity of new bone appears to have been produced about the margins of the aperture left by the exfoliation. The dura mater is preserved; isolated portions of the inner table of the skull, which did not exfoliate, are adherent to it; and there is a large oval aperture in it, through which the brain protruded. *From the Museum of John Taunton, Esq.*

1431. The portion exfoliated from the preceding skull. At its middle part it includes the whole thickness of the skull, in the rest of its extent only the outer table with more or less of the diploe.

The patient, at the time of his death, was a convict thirty-one years old. When about five or six years old, he had a fit during the cold stage of an ague, and fell with his head upon a fire, by which, before he could be removed, he was dreadfully

burned. For the following ten years his mother used to apply simple dressings to his head, and he worked in a blacksmith's shop. When he was sixteen years old, as he was striking very violently with a heavy hammer, the sequestrum fell from his head. But the same simple treatment was pursued towards the surface thus exposed; and he continued his work, enjoying perfectly good health, though the granulating surface left after the exfoliation did not heal. He was sent to the hulks at Portsea when he was 30 years old; and the surgeon, John Porter, Esq., collected from him the preceding history. After he had been there about eight months, during which he had worked hard and had been quite healthy, he had severe catarrh, with headache affecting especially the injured side, fever, and delirium. From these he recovered; but about four months afterwards, having been in the meantime nearly well, he was seized with very acute pain in the head, a large tumour appeared beneath the sore, and he became paralytic on the right side. Ultimately the tumour burst; and he died after a considerable quantity of cerebral substance had been discharged.

From the Museum of John Taunton, Esq.

1432. The upper part of a skull from which, apparently in consequence of a violent injury, a portion, including the whole thickness of the superior and posterior angles of the parietal bones, and of the superior angle of the occipital bone, suffered necrosis and exfoliated. The greater part of the sequestrum, in which there are two large trepan-holes, is preserved. The patient must have lived for a considerable time after the exfoliation took place; for the sequestrum is larger than that part of the aperture in the skull from which it was removed. The diminution of the aperture is the result of the growth of new bone from the borders of the inner table. By fitting the sequestrum to the aperture, it may be seen that in many situations a layer of new bone, more than half an inch wide, has been thus produced; a smaller quantity has grown from the outer table and the diploe.

1433. The upper part of a skull in which there are two apertures of irregular form, each about three quarters of an inch wide, in the left parietal bone, near its anterior and inferior angle. Around the apertures the external table of the bone has been, to some extent, removed; but the remaining surface

and the margins of the apertures are smoothly cicatrized. On the right parietal bone there has been a similar superficial loss of substance ; but here also the remaining surface has healed. It is probable that these changes were consequent on necrosis of the skull.

1434. The upper part of a skull from which a portion of the left parietal bone was removed, probably after necrosis. The margins of the aperture are smoothly rounded-off.

Hunterian.

1435. Part of the skull of an Ass, from which a portion has been removed, by exfoliation or trepanning, from the junction of the parietal and frontal bones. The aperture is in part filled-up by the growth of bone from the margin of the inner table ; and new bone is deposited around it on the external surface. *Hunterian.*

1436. Various sequestra from skulls. In some the outer surface, or the greater part of it, is smooth and polished, the superficial laminæ of the bone being unaltered. In these the necrosis was probably the direct result of violence. In some the tables are generally, but superficially and uniformly, ulcerated ; and in these the necrosis may be presumed to have succeeded to disease consequent on injury, such as diffuse suppuration beneath the pericranium, and between the bone and dura mater. In others the outer table is irregularly, and in many parts very deeply, ulcerated ; in some of these the diploe is destroyed, probably from suppuration through its texture. In some the tables are perforated by numerous small circular ulcers. Most of these have the characters of sequestra, separated after injury and consequent inflammation of the adjacent parts. *Hunterian.*

Bones of the Face : 1437 to 1449.

1437. The ossa nasi of a young man which separated, nearly entire, after necrosis.

The patient had had syphilis seven years before the separation of the bones and had taken a large quantity of mercury.

From the Museum of Robert Liston, Esq.

1438. An entire vomer, separated from its articular connections after necrosis. *From the Museum of Sir A. P. Cooper.*

1439. Portions of the upper and lower maxillary bones of a child, exfoliated in consequence of necrosis. The largest portion of the upper maxillary bone is from the right side, and includes the last two molar teeth, one of which is still enclosed within its capsule. Another and smaller portion from the upper jaw includes one of the bicuspid teeth. The exfoliation from the lower jaw comprises the posterior wall of its middle portion, as far as the first molar tooth on each side. On the posterior surface of this portion new bone had been deposited before the exfoliation took place.

From the Museum of John Howship, Esq.

1440. Necrosed portions of the alveolar processes of the upper and lower jaw, including the right upper first molar, two right lower milk-molars, with the germs of the right upper second and the right and left lower first premolars.

From a boy aged 10, who was attacked with gangrenous stomatitis when recovering from scarlet fever. This complication caused necrosis of the alveoli and cicatricial closure of the jaw, which was remedied by an operation. The preparation, as well as 1441, illustrates the disease known as exanthematous necrosis. (See 'Injuries and Diseases of the Jaws,' by Christopher Heath, 2nd edition, p. 107.)

Received with the Jacksonian Prize Essay, 1868.

1441. Necrosed portions of the alveolar border of the lower jaw. The disease is almost symmetrical ; but the right side is involved more deeply than the left. On the right side the sequestrum originally contained the first permanent

molar, the permanent bicuspid teeth which were uncut, and a temporary molar. It also involved part of the socket of the second permanent molar behind and the canine in front. Several of the teeth have been lost. On the left side the small portion of alveolar border involved includes a temporary molar tooth.

From a girl aged 13. The necrosis followed scarlet fever. (See 'Injuries and Diseases of the Jaws,' by Christopher Heath, 2nd edition, p. 108.)

Received with the Jacksonian Prize Essay, 1868.

1442. The condyle, coronoid process, and part of the ramus of a lower jaw, necrosed and removed during life. The neck and adjacent part, as far as the coronoid process, are greatly altered in shape by formation of new bone; on the outer side of the ramus is a porous deposit.

From a girl aged 10, under the care of Mr. Lawson. The disease commenced with swelling and the formation of abscesses over the lower jaw. The dead bone was removed. The articular cartilage and periosteum around were healthy. The lost bone was not renewed; and there was much subsequent cicatricial contraction of the mouth, only temporarily relieved by operation. The case appears to have been one of osteitis; and the deposit of new bone is not unlike that seen in cases of necrosis from chronic phosphorus poisoning. (See 'Diseases and Injuries of the Jaws,' by Christopher Heath, 2nd edition, p. 126.)

Received with the Jacksonian Prize Essay, 1868.

1443. The greater part of the left half of a lower jaw, exfoliated after necrosis. Previous to the necrosis the whole surface of the bone had been irregularly ulcerated; and porous, grey, new bone had been formed on it in small scattered patches. *From the Museum of George Langstaff, Esq.*

1444. A lower jaw, from which all the alveolar border, from the symphysis to the second molar tooth on each side, has been removed, probably in consequence of necrosis. The remaining bone is sound, and its surface is covered with a smooth layer of compact substance. The separated portion included the anterior part of the inferior dental canals,

each of which now opens by a wide orifice in the margin of the remaining bone.

From the Museum of Sir A. P. Cooper.

1445. Part of a lower jaw, ulcerated and after necrosis separated.

Hunterian.

1445 A. A large portion of the symphysis and of the left side of the lower jaw of an adult which exfoliated after necrosis. There are small portions of new bone on parts of its surface.

Hunterian.

1446. The angle, with portions of the body and left ramus of a lower jaw, completely separated from the rest of the bone by necrosis.

1447. A portion of the left ramus of a lower jaw, including the canine, bicuspid, and two molar teeth, removed during life. It is laid open by a longitudinal section to show a small cavity in which is lodged a sequestrum of extremely dense necrosed bone. This cavity communicates with the outer surface of the bone by a sinuous canal. The neighbouring bone is greatly enlarged, swollen, and very compact; and the marks of a trephine remain on the outer surface.

From a girl aged 15. Four years before operation she caught cold and complained of severe aching in all her teeth. A swelling of the left side of the lower jaw followed; this attained its maximum in a few days, and then subsided to the size of a hen's egg, and remained stationary till an operation was performed. Abscesses formed, small portions of bone came away through fistulous orifices, and a molar tooth was lost. After an unsuccessful attempt to penetrate the diseased portion of jaw with a trephine, it was removed.

Presented by John Adams, Esq., 1864.

1448. The skull of a Rabbit, in which the left horizontal ramus of the lower jaw is much expanded, and with porous new bone formed upon its surface. The teeth are sound; but

the alveolar process in which they lie is bare and necrosed. The thickening of the bone extends as far as the incisors in the median line in front.

Presented by P. Wright, Esq., 1873.

1449. The skull of a Kangaroo. The right side of the lower jaw, including the incurved portion of the angle, is the seat of extensive ulceration and formation of new bone. The right malar bone is similarly affected. The general features of the disease are like those in the last specimen.

Presented by the Zoological Society, 1876.

Bones of the Trunk : 1450 to 1452.

1450. A rib, from which a considerable portion separated after necrosis. That which remains is healthy in structure ; and its surfaces and edges are smoothly healed.

From the Museum of Robert Liston, Esq.

1450 A. Two ribs, each with a circumscribed necrosis on the inner aspect. New bone is formed around and for some distance beyond the seat of necrosis.

Presented by Joseph Hodgson, Esq., 1869.

1451. A sternum in which there has been necrosis of several small portions of the cancellous tissue. The cavities in which the sequestra were contained and in which portions of them, imperfectly detached, still remain, open by circular and oval orifices on both surfaces of the bone. New bone has also been formed in a thin layer on the greater part of both the surfaces. *Presented by Sir William Blizard.*

1452. Several small portions of bone, marked "Bones voided by urine, after a blow on the lower part of the back, by Mrs. Wiltshire, recovered. Dr. Lewis attended her during the illness." They are chiefly thin scales of apparently healthy compact bone ; one of them is like a portion of the trans-

verse process of a vertebra ; none of them have the aspect of ordinary sequestra. *Hunterian.*

Bones of the Upper Extremity : 1453 to 1474.

1453. The greater part of a clavicle, including its sternal extremity and three fourths of its shaft, separated after necrosis.

The patient was a girl 15 years old.

From the Museum of Robert Liston, Esq.

1454. A scapula in which, after a gun-shot wound, necrosis of a portion of the inferior border ensued. The necrosed portion lies at the bottom of a shallow cavity in the border, but is only partially separated. The adjacent part of the border is thickened ; and above it is an opening through the bone with sharp smooth edges. *Hunterian.*

1454 A. A left scapula, which has been the seat of acute inflammation. Large portions have suffered necrosis and have been removed. Of the glenoid surface, neck, coracoid process, acromion and spine, scarcely any traces are left. The remainder is of light spongy texture, with outgrowths of new bone of the same character, especially along the anterior border and at the root of the acromion, where they arch over tunnel-shaped cavities from which sequestra have been removed. One of the original sequestra still remains imbedded at the last-named situation ; many of the others are placed upon the bottom of the shade which contains the specimen.

From a girl 14 years old. The disease first showed itself by pain at the top of the shoulder, followed by the formation of abscesses, which left numerous sinuses through which portions of necrosed bone were discharged. On the 10th of May, 1858, the whole of the bone forming the preparation was removed by operation. The acromial third of the clavicle, being similarly diseased, was also removed. The head of the humerus was healthy and covered with its natural cartilage. The patient recovered, with very considerable use of the arm.

A full report of the case is published in the 'Medico-Chirurgical Transactions,' vol. xlii. p. 7.

Presented by George M. Jones, Esq.

1455. The upper half of a humerus, in which there has been necrosis of a portion of the wall and cancellous tissue immediately below the head. The sequestrum, which is more than six inches long, lies loose in a large cavity in the upper part of the shaft; and one of its extremities projects through an ulcerated aperture in the articular surface of the head. There are three other large apertures leading through the inner and anterior parts of the shaft into the cavity containing the sequestrum; and a small one low down extends through the outer wall. The walls of the rest of the shaft are enlarged and heavy; but there is not much new bone on them. *From the Museum of Robert Liston, Esq.*

1456. A humerus, in the upper part of which there has been necrosis of a portion of the walls and cancellous tissue. There is a cavity in the interior of the shaft, just below the tuberosities, with four large openings into it. The margins of these openings are smoothly rounded, and but little new bone is deposited around them. The rest of the shaft is healthy. *From the Museum of Robert Liston, Esq.*

1457. The lower part of the shaft of a humerus, from which a portion of the cancellous tissue and walls exfoliated after necrosis. The cavity which contained the sequestrum remains wide open. The whole of the rest of the shaft is altered in shape by superficial formations of new bone.

Hunterian.

1458. "An internal exfoliation from Mr. Mothland's Os Humeri, 1775."—*Hunterian MS. Catalogue.*

1459. The bones of an elbow-joint. There has been necrosis with ulceration of a small part of the outer condyle of the humerus; and a portion of its cancellous tissue remains only partially detached from the adjacent bone, from which it may be distinguished by its spongy texture and dead-

white colour. New bone is formed in irregular pointed processes around the seat of the necrosis and in small quantity upon the upper parts of the radius and ulna. The shafts of all the bones are light, soft, and greasy ; but their articular surfaces are sound.

The patient was a woman 32 years old, in whom the disease had existed sixteen years. She recovered after amputation of the arm.

From the Museum of Robert Liston, Esq.

1460. The humerus of a Swan, from which a thin portion of the exterior of the walls has exfoliated. The sequestrum is nearly four inches long ; and its centre is perforated by a small shot, which is loose in the interior of the bone. A small quantity of new bone has been formed on each side of the part from which the sequestrum was removed, and a larger quantity at each end of it. *Hunterian.*

1461. A radius, of which nearly the whole of the middle third and a small portion at the tuberosity suffered necrosis. Portions only of the superficial lamellæ are connected with the sequestrum ; the greater part of its surface is roughly ulcerated. A thin layer of new bone is formed on nearly all the portions of the shaft which did not perish.

1462. The bones of a forearm, with part of the humerus. Large portions of the shafts of both the radius and ulna have separated after necrosis. New bone has been abundantly produced around the sequestra, locking-in some portions of them, and firmly uniting the remaining parts of the shafts. There is osseous ankylosis of the elbow-joint ; and a large opening in the inferior articular surface of the radius communicates with one of the cavities containing dead bone.

Hunterian.

1463. A thick irregular case of new bone formed around a sequestrum, which comprises the greater part of the shaft of

an ulna. The new bone formed upon the articular portions of the ulna which did not perish, and that formed around the sequestrum, have coalesced into one cylinder, which is complete with the exception of several round and irregular apertures in its posterior part. In both the articular surfaces of the ulna there are apertures communicating with cavities containing sequestra. *Hunterian.*

1464. The bones of an elbow-joint. A large portion of the upper and posterior parts of the ulna, immediately below the olecranon and the coronoid process, has separated after necrosis. In its place there is a cavity of corresponding size, widely open posteriorly, and having large round orifices of communication with the elbow-joint above and in front. Its walls are formed of the remains of the original shaft, thickened, and covered with new bone. There is complete osseous ankylosis of the humerus to the radius, and to the remains of the ulna, and of a part of the shaft of the ulna to the corresponding part of the radius. The radius is irregularly enlarged in the upper part of its shaft.

Presented by Sir William Blizard.

1465. A large sequestrum from an ulna. *Hunterian.*

1466. A thumb, in which there has been necrosis of the whole last phalanx. The exfoliated phalanx is exposed by a section, made after amputation, through the palmar aspect of the thumb. A bristle is passed into the cavity in which the phalanx lies, through an opening on the dorsal aspect of the thumb where an abscess pointed and opened.

The disease had at first the characters of deep-seated whitlow, and was not actively treated.

From the Museum of George Langstaff, Esq.

1467. The bones of a finger. Nearly the whole of the interior of the first phalanx has been destroyed, and four large

round apertures lead through the walls into the cavity within it. The walls themselves are expanded. The articular surfaces and the other phalanges are healthy.

Probably these changes were consequent on necrosis of a portion of the cancellous tissue.

From the Museum of Robert Liston, Esq.

1468. The remains of a digital phalanx after necrosis and exfoliation of nearly the whole of the middle of its shaft. New bone of light and porous texture is formed upon them. *Hunterian.*

1469. The bones of a finger, amputated with the distal end of the metacarpal bone. A considerable part of the wall of the first phalanx has suffered necrosis. Portions of sequestra have separated from the palmar surface of the bone; and part of its dorsal surface is exposed in a state of necrosis. The adjacent living parts of the shaft are covered with a thin layer of new bone. The articular surfaces are uninjured. Both the other phalanges are superficially ulcerated; and part of the dorsal surface of the second appears to be marked out for exfoliation by a groove surrounding it.

The disease was of only six or seven days' duration. The tendons of the finger were destroyed.

From the Museum of Robert Liston, Esq.

1470. The bones of a little finger and the distal half of its metacarpal bone. The last phalanx is healthy; the proximal extremity of the second is deeply ulcerated and its articular surface is destroyed; of the third, two small detached portions alone remain, and these appear to have separated after necrosis. The articular surface and the distal end of the metacarpal bone are deeply ulcerated; its shaft is covered with new bone.

Amputated from an old boatman. The disease was of only eight or ten days' duration.

From the Museum of Robert Liston, Esq.

1471. The greater part of the last phalanx of a thumb, exfoliated after necrosis. *Presented by —— Fowler, Esq.*

1472. Portions of two digital phalanges, separated after necrosis, viz. :—1. The distal articular extremity of the first phalanx of a thumb, exfoliated in the twelfth week after the formation of a deep abscess around it ; 2. The proximal articular extremity of the last phalanx of a little finger, exfoliated in the tenth week from the commencement of the disease.

From the Museum of John Howship, Esq.

1473. Nearly the whole of the last phalanx of a thumb, exfoliated in a case of whitlow.

From the same Museum.

1474. The necrosed ungual phalanx of a finger ; it is much diminished in size, rough and porous from absorption.

Presented by Sir William Fergusson, 1875.

Pelvis and Lower Extremity : 1475 to 1573.

1475. A sequestrum from the crest of an ilium, including a great part of the crest and the anterior superior spine. Below it is placed another thin sequestrum from the compact tissue of the bone near the crest.

From a youth aged 17. Ten years before operation his hip-joint became diseased, and abscesses formed. The joint became stiff; and three or four sinuses remained open below the crest of the ilium. The necrosed bone was removed, the hip-joint remaining firmly ankylosed.

Presented by Sir William Fergusson, 1872.

1476. A femur, several parts of which have suffered necrosis. The whole bone, with the exception of the head, neck, and lower epiphysis, has in consequence undergone changes. Around and through an extent of about three inches below the great trochanter the shaft is enlarged, and its surface is made uneven by projecting points and plates of new bone. In this part, also, are several round apertures leading to the interior of the bone, in which there is a portion of cancellous tissue nearly two inches long separated after necrosis. For an extent of two inches below this part, which was sawn through in amputation, the shaft is scarcely larger than is natural, but its exterior is uneven. In the lower half of the bone the wall, through a length of about four inches and through nearly two thirds of its circumference, has exfoliated. The anterior part of the wall, which did not perish, is considerably thickened. At the posterior part a large quantity of new bone has been produced, some of which projects far over the sequestrum, so as to lock it in, though without forming a complete case around it. Below this sequestrum, and within an inch of the epiphysis, the femur is traversed from behind forwards by a fistulous canal, in the course of which is a small portion of the necrosed cancellous tissue.

The patient was a boy 8 years old, in whom the disease, attributed to a fall upon ice, had existed for more than a year. Before amputation the limb was greatly swollen, and there were two fistulous openings at the lower part of the thigh which led to the diseased bone. Amputation was performed; and on the twelfth day repeated hæmorrhages from the stump occurred. The common iliac artery was tied, and transfusion was employed with some benefit; but the patient died about twenty-four hours after the tying of the artery.

From the Museum of Robert Liston, Esq.

1477. The lower two thirds of the right femur, without the epiphysis, of a young person. Nearly the whole of the shaft has suffered necrosis. The groove which separates the dead from the living portion of bone is very distinct; the surface of the former is much eroded, especially towards the

upper end of the specimen. It is in most places surrounded by a thin shell of new bone.

Presented by Sir Stephen L. Hammick.

1478. A femur with parts of the tibia and fibula, and the patella, exhibiting the effects of extensive necrosis of the shaft of the femur. The surfaces of the head and of the lower part of the neck of the femur are partially but deeply ulcerated. Around the trochanters the shaft is enlarged and its surface is uneven. On its inner aspect, in the place of the lesser trochanter, is a large oval opening through its wall, which leads into a cavity in its interior and communicates with another opening of smaller size, rather lower down, on the anterior aspect of the shaft. Within this cavity lies a portion of the inner part of the wall, nearly two inches long, completely separated after necrosis. At this part all the cancellous tissue and the internal laminæ of the wall seem to have perished by necrosis or ulceration ; for the part of the wall which remains and encloses the cavity containing the sequestrum is thin and transparent. Below this cavity the shaft, through an extent of about four inches, is entire, but much enlarged, and its surface is rendered irregular by deposits of new bone, especially on its posterior part. In the lower third of the femur nearly the whole thickness of the shaft perished. A sequestrum, six inches in length, comprising nearly all the posterior, inner, and outer wall, large portions of the cancellous tissue, and of the inner layers of the anterior wall of this part of the femur, lies loose in a cavity within the new bone. This cavity is nearly open behind ; and in front is imperfectly covered by that portion of the shaft which did not perish but which is thickened and enlarged. The condyles are light and spongy, reduced in size, and altered in their form. The cartilages of the knee-joint are destroyed. The head of the tibia is superficially ulcerated, and, with the fibula, is dislocated backwards and forwards.

The patient was a man 22 years old. The disease had existed for eighteen months, and was believed to have originated in a fall on ice. When the patient became hectic and about to sink,

amputation at the hip-joint was performed. He died on the second day after the operation.

From the Museum of Robert Liston, Esq.

1479. The upper part of a femur exhibiting necrosis of two or more portions of the cancellous tissue of the great trochanter. The dead bone is not completely separated, and lies at the bottom of a cavity in the trochanter and neck of the femur which opens externally through two large round apertures. New bone has been formed about the trochanter.

From an old man in whom the disease had long existed.

From the Museum of Robert Liston, Esq.

1480. The upper half of the femur of a young person, with an abundant deposit of new bone on the upper and inner part of the shaft about the lesser trochanter. Two large oval apertures lead into a cavity beneath the new bone. The changes were probably consequent on necrosis.

Presented by Sir William Blizard.

1481. The shaft and lower end of a femur, with the heads of the tibia and fibula. The posterior wall of the femur has become necrosed; the remainder of the shaft is covered with extensive superficial formation of new bone, in which are large cloacæ. Along the posterior aspect of the femur are ridges of new bone, apparently developed from displaced periosteum, and partially covering-in the space containing the sequestra. The cancellous tissue of the heads of the tibia and fibula and of the back of the patella has been the seat of inflammation. The articular surfaces of these bones and of the femur are deprived of their cartilages and superficially ulcerated; and the adjacent parts of the bones are very light and spongy.

From a youth aged 19. Eighteen months before amputation the disease commenced with swelling; two incisions were made, much pus was let out; and acute inflammation of the knee-joint took place.

Presented by Sir William Fergusson, 1869.

1482. The lower half of a femur, of which a large portion of the wall suffered necrosis and separated. The sequestrum is upwards of four inches long, and in the greater part of its length comprises the whole circumference of the wall. The cancellous tissue within it is healthy ; and a large quantity of new bone has been formed on the shaft above and below the sequestrum, especially on the posterior surface of the part above it. There is extensive and deep ulceration of the bone at the lower end of the shaft close by the epiphysis ; but the epiphysis itself is healthy.

Presented by Sir William Blizard.

1483. The lower two thirds of a femur, in which it is probable there had been necrosis of a portion of the cancellous tissue. The shaft is in every part enlarged ; and its surface is rough, uneven, and beset with points and plates of new-formed bone. Several oval apertures traverse the thickened wall, and lead into a large cavity extending through nearly the whole length of the medullary tube. There are also several smaller apertures through the articular surface of the bone and through the cartilage. The substance of the condyles is light and soft, and their lateral surfaces are spongy.

The patient was a man 45 years old. After he had suffered for some months with severe pain at the lower part of the femur, an abscess formed around the bone, which was evacuated by incision. Some time afterwards, the discharge continuing and his health being much impaired, the limb was amputated. After the flaps had been formed the exposed bone was found thickened and uneven ; but, the hæmorrhage being profuse, it was sawn through, and ligatures were applied to the bleeding vessels. An incision was then made on the outside of the thigh upwards from the outer angle of the flaps, and the bone was sawn through at a healthy part about three inches higher. The patient recovered. The portions, separately sawn off, are now connected.

From the Museum of Robert Liston, Esq.

1484. The lower end of a femur, in which it is probable that there has been necrosis of a portion of the cancellous tissue. At the lower part of the shaft is a large cavity, which probably contained a portion of dead bone. This cavity opens widely through the posterior wall, and by a narrow aper-

ture through the anterior wall; below, it appears to have opened through a long passage into the knee-joint. The whole shaft is very much enlarged. At the transverse section, about eight inches above the condyles, the medullary tube is only a quarter of an inch in diameter, but the wall is, at the posterior part, nearly an inch thick. The whole substance of the walls is composed of a porous heavy tissue; the exterior is in some parts smooth, but in others is roughly covered with new bone. There has been ulceration of portions of the articular surfaces and of the posterior part of the condyles. *Hunterian.*

1485. Vertical sections of the lower end of a femur, in which there has been necrosis of a small portion of the cancellous tissue. In the middle of the shaft is a cavity, from which a wide canal leads obliquely downwards and forwards through the walls. The cavity is bounded by cancellous tissue, somewhat condensed; and a few small portions of dead bone are adherent to its interior. The shaft around the cavity is enlarged by thickening, with increased density of its walls, and plates of new bone are formed upon its exterior. *Hunterian.*

1486. The lower end of a femur, of which a large portion, just above the condyles, suffered necrosis. The sequestrum, which is nearly six inches long, is enclosed in a cavity formed by the remains of the walls covered with new bone, which cavity is widely open behind and below, and perforated by several small round apertures in front and at the sides. The epiphysis, which had not yet united with the shaft, is healthy, but is drawn backwards; and the anterior wall of the femur projects a little over it.

Presented by Sir William Blizard.

1487. The lower end of a femur, in which there has been necrosis of a small portion of the walls and cancellous tissue just above the condyles. In the middle of the shaft is a cavity from which the sequestrum has been removed. It opens widely in front and by two small apertures on the side of the inner condyle; its walls are formed of indurated can-

cellous tissue. The shaft around and above the cavity is thick and heavy; new bone has been formed on its surface; and the cancellous tissue is nearly consolidated. The articular surfaces of the condyles are ulcerated; and the patella is ankylosed to the outer condyle.

Presented by Sir William Blizard.

1488. Portions of a femur, including nearly the whole thickness of the shaft, and measuring in united length about four inches, which exfoliated after seven years' disease.

From the Museum of Sir A. P. Cooper.

1489. Part of a left femur removed as a sequestrum during life. It comprises the whole of its lower end, excluding the epiphysis.

From a boy aged 11. He had been well-fed and healthy when an infant; but after spending a few months in a workhouse his health declined, and through a slight injury to the left knee abscesses formed above it. Several months later the sequestrum here exhibited was removed. He afterwards suffered from necrosis of the lower angle of the scapula. It was not until the age of 17, six years after the loss of the sequestrum, that he was restored to good health. The affected thigh was then three inches shorter than the sound one; and the tibia was ankylosed to the femur at nearly a right angle. (See MS. Notes, vol. ii. p. 164.)

Presented by John Birkett, Esq., 1875.

1490. A portion of the compact tissue of the shaft of a femur, separated by necrosis, and removed from the popliteal space by trephining.

Presented by F. LeGros Clark, Esq., 1876.

1491. A patella partially necrosed. Its anterior aspect is rough; and the greater part of the periosteum has separated. A deeply excavated carious cavity occupies the upper part of its posterior surface, which is here denuded of its cartilage. Below the cavity the cartilage is healthy and adherent to the bone.

From a girl aged 14. The patella was exeised; and the patient recovered, with free use of the joint.

Presented by John Gay, Esq., 1876.

1492. A tibia in which, after necrosis of nearly the whole length and thickness of the shaft, an almost complete case of new bone was formed around the sequestrum. The epiphyses, with which the case of new bone is firmly and smoothly connected, are unaltered. The interior of the case is compact and nearly smooth; its exterior also is hard, but more rugged. There are several apertures in it, especially along its anterior part, through which the size and form of the enclosed sequestrum may be seen. The surface of the sequestrum is, in nearly every part, rough, comprising only a few scattered portions of the superficial laminæ of the original shaft. *Presented by Sir Everard Home.*

1493. A left tibia, with the fibula and part of the astragalus. Nearly the whole of the shaft of the tibia, including the inferior articular extremity, has suffered necrosis and has become detached from the living portion. It is partially encased in a thick sheath of new bone, of light spongy texture. The astragalus and both ends of the fibula bear evidence of having suffered from inflammation.

Presented by Sir Stephen L. Hammick.

1494. A right tibia and fibula. The entire shaft of the tibia has suffered necrosis, in consequence of a severe blow terminating in extensive ulceration of the integuments. Its surface is rough and eroded. Abundant new bone, of nodulated exterior and very spongy texture, has been formed around it in an incomplete sheath extending from one articular extremity to the other. Some nodules of new bone have also formed on the contiguous surface of the fibula.

Presented by Sir Stephen L. Hammick.

1495. A left tibia and fibula. Nearly the entire shaft of the tibia has suffered necrosis. The dead portion is now divided into two sequestra, which are embraced by a thick sheath of new bone, continuous along the posterior aspect but having large openings in front. New bone, mostly of a scaly character, has been formed on the surface of the fibula.

The disease arose from a slight injury to the skin, which was followed by inflammation of the whole leg and by abscesses. Amputation was performed eighteen months after the receipt of the injury.

Presented by Sir Stephen L. Hammick.

1496. A right tibia, nearly the whole shaft of which has suffered necrosis. The sheath of new bone which has been formed around it is thick posteriorly, but deficient in front and at the sides. *Presented by Sir Stephen L. Hammick.*

1497. A left tibia and fibula. A considerable portion, if not all, of the former has suffered necrosis. There are two large, irregular, deeply eroded sequestra, partially imbedded in the new shaft composed of finely cancellated osseous tissue. Some new bone has also been formed upon the surface of the fibula, by which it is united at two points to the tibia.

Presented by Sir Stephen L. Hammick.

1498. A left tibia, various portions of the shaft of which have suffered necrosis, and are partially detached from the living bone. Upon the surface of the latter much new bone has been deposited, which in many places projects over, and partially encases, the dead portions of the shaft.

Presented by Sir Stephen L. Hammick.

1499. A portion of a right tibia, of which the lower half of the shaft has suffered necrosis. The thick, nodulated case of new bone which has formed around the sequestrum is deficient upon the inner side.

From a seaman, the skin of whose leg was rubbed by a cable. Sloughing ulceration was the consequence; and this continued for two years, the ulcers occasionally putting-out feeble granulations and then sloughing again. Amputation was performed.

Presented by Sir Stephen L. Hammick.

1500. A right tibia which appears to have suffered from long-continued inflammation. The whole of the surface is covered with a layer of finely porous new bone, most abun-

dant and dense upon the posterior aspect. A considerable portion of the shaft is necrosed, the sequestrum being exposed at a large oval aperture on the inner side of the casing of new bone. The edges of this aperture and the surface of the neighbouring new bone appear to have been removed by ulceration.

The disease commenced in an ulcer upon the inner side of the leg. As this continued to increase for three years, and resulted in necrosis, amputation was performed.

Presented by Sir Stephen L. Hammick.

1501. A left tibia in which necrosis of nearly the whole shaft has taken place. A complete case of new bone has formed around it connecting the two articular extremities, which are not involved in the disease. On the anterior and inner side of this case are numerous cloacæ through which the sequestrum is seen. The surface of the sequestrum is very rough. *Presented by Sir Stephen L. Hammick.*

1502. A tibia of which nearly the whole shaft has suffered necrosis. It is enclosed in a thick case of new bone, most abundant on the posterior aspect. In this there are numerous circular cloacæ, those on the anterior surface having coalesced into two long irregular openings. The sequestrum has been perforated by a trephine, apparently in an unsuccessful attempt to remove it.

The disease followed a slight injury, two years after which the limb was amputated. The patient quickly recovered.

Presented by Sir Stephen L. Hammick.

1503. A left tibia and fibula. A considerable portion of the shaft of the tibia has suffered necrosis, and is completely encased in new bone. Portions of the sequestrum appear to have been discharged (those that remain are very rough); and the spaces they occupied were being filled up by the growth of new bone. The surface of the latter is more dense and smooth than in the preceding specimens, and it altogether appears to indicate a more advanced stage of the process by which the destructive effects of necrosis are repaired.

The shaft of the fibula has been inflamed and is covered with new bone. Near the lower end there is a cavity, from which a portion of necrosed bone has, probably, been discharged. *Presented by Sir Stephen L. Hammick.*

1504. A tibia and fibula from a young person. Nearly the whole length and, in many parts, nearly the entire thickness of the tibia have suffered necrosis. The dead bone is almost surrounded with a groove ; but its separation is incomplete. A small quantity of new bone is formed on the outer surface of those parts of the shaft which did not perish ; but, near the articular ends, these portions are deeply ulcerated. The lower epiphysis, also, is almost destroyed by ulceration. The fibula is healthy. *Presented by Sir William Blizard.*

1505. A tibia of which nearly the whole shaft suffered necrosis. The sequestrum comprises all the length of the shaft with the exception of about an inch at each extremity, and, in some situations, includes the whole thickness of the wall. A considerable quantity of new bone is formed behind the sequestrum, but none anteriorly, except in one situation, a little below the tuberosity, where a thin scale is attached to the surface of the sequestrum. It is not improbable that this and some smaller portions near it were deposited on, and became adherent to, the surface of the bone before it had perished. *Hunterian.*

1506. A tibia of which a portion, about ten inches long, comprising part of the cancellous tissue of the head and nearly the whole thickness of the shaft, suffered necrosis. The sequestrum is completely separated, but is held in its place by the incomplete case of bone composed of the adjacent surviving parts of the shaft and the new bone formed on them. A small ulcerated opening leads into the knee-joint. On some parts of the sequestrum are portions of new bone, probably deposited before its death. *Hunterian.*

1507. A tibia, after necrosis of a narrow portion of nearly the whole length of its anterior wall and of some of the subjacent cancellous tissue. A deep channel remains widely

open along the front of the tibia, from which the sequestrum was removed. The lateral and posterior boundaries of this channel are formed of hard and heavy new bone, and of cancellous tissue which is also much harder, closer, and heavier than is natural. The rest of the shaft is enlarged, increased in weight, and covered with hard new bone. At the middle of its posterior wall is a round aperture leading into the channel just described. The epiphyses and parts of the shaft immediately adjacent to them are healthy.

Presented by Sir William Blizard.

1508. A section of a tibia, of which a portion of the middle of the shaft has suffered necrosis. The sequestrum is completely separated ; and part of it has been removed ; but part is still retained in its place by the case of new bone which has been very abundantly formed around it. This, though appearing light, porous, and friable on the surface, is very dense within, as seen in the section.

The inflammation of the bone was the result of a severe cut through the integuments of the anterior aspect of the leg, which ended in sloughing. The limb was subsequently amputated.

Presented by Sir Stephen L. Hammick.

1509. Section of a tibia, of which a portion about two inches long, near the inferior extremity, separated after necrosis. The sequestrum is enclosed in a cavity, of which the walls are chiefly formed of new bone, and into which several small round apertures lead. The whole shaft of the tibia is thickened ; its surface is uneven and porous ; and its medullary tube, diminished in size by the thickening of the walls, is almost filled with compact osseous tissue.

Presented by Sir William Blizard.

1510. The other section of the same tibia, showing the rest of the cavity in which the sequestrum lay, with its walls formed of healthy and thickened cancellous tissue.

Presented by Sir William Blizard.

1511. A tibia in which, probably after the separation of a large

portion of dead bone from the front wall, the remaining substance of the shaft is enlarged and increased in weight, its cancellous tissue and walls being consolidated into a nearly uniform, hard and porous tissue. A small sequestrum of cancellous tissue is suspended by the side of the tibia ; and in the place whence, it is probable, large sequestra were removed, is a large shallow cavity or channel with widely everted edges. The upper and lower parts of the shaft are healthy. *Presented by Sir William Blizard.*

1512. The upper part of a tibia, from the front of which a large portion has exfoliated, leaving a deep cavity, completely open anteriorly and with its posterior and lateral walls formed of compact heavy bone. The shaft below this cavity is enlarged ; its surface is uneven, its tissue hard and heavy, and its medullary tube nearly obliterated.

Presented by Sir William Blizard.

1513. A tibia in which there has been necrosis of numerous scattered portions of the wall and cancellous tissue of the upper part of the shaft. All the diseased part is enlarged : a great quantity of new bone has been formed upon its external, and a still larger quantity upon its posterior, surface. There are several round apertures in the new bone, through which portions of sequestra may be seen in an internal cavity. The superior epiphysis is not diseased ; but ulceration has penetrated deeply between it and the upper part of the shaft. *Presented by Sir William Blizard.*

1514. The upper third of a tibia. Between the tubercle and the anterior border of the articular surface is a deep ulcerated cavity, at the bottom of which is a black sequestrum partially detached. The surrounding surface is covered with irregular formations of new bone. The articular surface is healthy.

The patient was a man 22 years old. There was an abscess under the ligamentum patellæ but external to the joint. The necrosis was consequent on the application of the cautery. He recovered after amputation of the limb.

From the Museum of Robert Liston, Esq.

1515. A tibia in which there has been necrosis near the ankle-joint. All the lower part of the shaft and the epiphysis are enlarged ; and their external surface is made irregular by deposits of new bone, through some round apertures in which small sequestra are seen. Ulceration into the ankle-joint has taken place, and the whole of the articular surface of the tibia is destroyed. The upper part of the shaft is irregularly enlarged and ulcerated ; but no sign of necrosis is here observable. *Presented by Sir William Blizard.*

1516. A portion of the shaft of the left tibia, including an entire segment of the bone. It is necrosed, and is much thickened by inflammatory changes previous to the necrosis.

From a man aged 46. Eighteen years before this sequestrum was removed by operation he fell and sustained a compound fracture of the tibia and fibula. He recovered perfectly, till an abscess formed on the site of the injury three months before the operation. After the removal of the sequestrum he was able to walk well. (Trans. Path. Soc. vol. xx. p. 270.)

Presented by Francis Mason, Esq., 1868.

1517. Two portions of the anterior wall of a tibia, necrosed in consequence of a fracture.

From a labouring man, aged 51, admitted into the London Hospital, April 29th, 1850, with fracture of the middle of the left leg, and great bruising of the integuments, caused by crushing of the limb. After ten days the soft parts sloughed, leaving exposed the fractured ends of the tibia, denuded of periosteum and necrosed. Towards the latter part of August the limb became tolerably firm, from the union of the fractured fibula and the posterior part of the tibia. The necrosed portion of the upper fragment became loose, and was removed September 30th. The much smaller piece from the lower fragment did not separate until October 30, 1851 ; the comparative slowness of the process in the latter case being attributed to the impaired state of nutrition, consequent on the supply of blood from the medullary artery being intercepted by the injury. (Trans. Path. Soc. vol. iii. p. 432.)

Presented by T. Blizard Curling, Esq.

1518. Part of a tibia, from which a large piece of the anterior

wall, just below the tuberosity, has separated after necrosis. The adjacent part of the shaft is thickly covered with new bone, some of which has extended over the margins of the sequestrum and retains it in its place. There are several ulcerated apertures in the articular surface of the tibia and around its epiphyses. *Hunterian.*

1519. The shaft of a tibia, in which necrosis has affected several isolated portions of the surface of the walls near its upper end. The adjacent parts of the bone are rough, partly as if from superficial ulceration, partly from the deposits of new bone. *Hunterian.*

1520. Part of a tibia, with a large sequestrum separated from its anterior wall. Several small holes have been bored into the sequestrum, probably for the purpose of applying some substance supposed likely to accelerate its separation. The surrounding parts of the shaft are covered with abundant deposits of new bone.

1521. A tibia, of which a portion near the ankle-joint, about three inches long and comprising a great part of the thickness of the shaft, suffered necrosis. A large quantity of light and friable new bone has been formed very irregularly around it. The upper part of the shaft is superficially ulcerated, and has thin layers of new bone upon it.

Hunterian.

1522. A tibia, of which a portion of the walls, with some of the cancellous tissue, near the ankle-joint has separated after necrosis. A great quantity of new bone has been formed on the adjacent part of the shaft. The cavity containing the sequestrum is very large and opens widely through the lower articular surface of the tibia. The rest of the shaft bears marks of unnatural vascularity. *Hunterian.*

1523. Part of a tibia, at the lower end of which there are numerous oval and round apertures in the walls, and fistulous

canals and cavities in the interior. Several of these cavities open upon the articular surface, the intervening parts of which are superficially ulcerated. In one of the cavities there is a small loose sequestrum of compact tissue. The adjacent part of the shaft is in some situations enlarged, in others superficially ulcerated. *Hunterian.*

1524. Part of a tibia from which a portion of the anterior wall separated after necrosis. It lies loose in a cavity, the anterior part of which is formed of new bone and is perforated by several round apertures. The adjacent part of the shaft is enlarged by superficial deposits of new bone.
Hunterian.

1525. A tibia, of which a portion, upwards of five inches long and comprising nearly the whole thickness of the shaft, separated after necrosis. New bone has been formed on the shaft above and below the sequestrum, and a large quantity on the outer and posterior part, where the sequestrum does not comprise the whole thickness of the wall. A narrow strip of new bone, opposite the spine of the tibia, is all that connects the portions of the shaft above and below the sequestrum. *Hunterian.*

1526. A tibia, of which nearly the whole length, and in many parts the whole thickness, of the shaft suffered necrosis. The separation of the dead bone is not complete ; it adheres by its extremities to the epiphyses and the portions of the living shaft near them. New bone has been produced abundantly upon those parts of the surface of the shaft which did not perish ; but the walls thus formed are very imperfect, and at both the upper and lower parts wide spaces intervene between the new walls and the epiphyses. *Hunterian.*

1527. A tibia, of which a large portion of the shaft, including more than half its anterior wall, suffered necrosis. The dead portion is completely separated, but is retained within an imperfect cavity formed by the remaining portions of the shaft and by the new bone deposited upon them, some of

which has grown so as to project over the margins of the sequestrum. No new bone has been formed opposite that part of the sequestrum which comprises the superficial layers of the original shaft. *Hunterian.*

1528. A tibia, of which the whole of the shaft suffered necrosis, with the exception of the superficial layers of its outer and posterior walls and a small part of those of its anterior wall. The separation of the dead portion is complete. New bone has been abundantly formed behind it and on its outer side, but none in front of it except at its upper part, where a small quantity projects over it from the sides. A thin layer of new bone had been formed on the shaft previous to its necrosis, and perished with it. *Hunterian.*

1529. A child's tibia, of which the whole length of the shaft (except a small portion of its upper end) and its whole thickness (with the exception of its spine and portions of the edges of its lower part) suffered necrosis. The separation of the dead portion is complete. New bone has been formed on the upper living part of the shaft and around the lower end of the sequestrum. In the latter situation it is formed at only those parts beneath which the sequestrum does not comprise the superficial layers of the shaft. *Hunterian.*

1530. A tibia in which there has been necrosis of a portion of the anterior wall and cancellous tissue nearly twelve inches long. The separation of the sequestrum is complete ; and it lies loose in a cavity which is open along the whole front of the tibia, and of which the walls appear to be chiefly formed of new bone.
Presented by Sir William Blizard.

1531. The tibia of a child, on the exterior of which, after necrosis of several small portions of the interior of its shaft, new bone has been abundantly produced. *Hunterian.*

1532. The upper part of a tibia, in which, with extensive ulceration of the walls and necrosis of several small portions of

the deeper tissue, the epiphysis has separated from the shaft. The remains of the articular surface also are deeply ulcerated. *Hunterian.*

1533. A vertical section of a tibia, in which there has been necrosis of numerous small portions of the walls of the middle and upper parts of its shaft. The removal of these has left several irregular cavities in the interior, and apertures of various size and shape in the adjacent walls, of the tibia. The walls are thickened, both by the superaddition of bone and by their own expansion; their thickness and compactness are very different in different parts. There is a similar irregularity in the character of the cancellous tissue: in some parts its lamellæ are thick and very close set; in other parts the medullary tube is chiefly filled with fatty substance. *Hunterian.*

1534. Part of a tibia in which there has been necrosis of a small portion of the walls and cancellous tissue near its upper end. The sequestrum lies loose in a cavity in the interior of the bone, from which several apertures lead through the adjacent parts of the walls. Nearly all the rest of the shaft is enlarged and increased in density; and new bone is deposited on its surface. At the lower and front part of the shaft a circumscribed portion of this new bone has the characters of that which is usually formed under deep ulcers of the integuments of the leg. *Hunterian.*

1535. Part of a tibia "which had been often ulcerated; and, by being laid bare for some extent, the exposed surface became dead, and the process of separating was just beginning."
Hunterian MS. Catalogue.

1536. A nearly similar specimen: a tibia, from the anterior surface of which an oval portion was in process of exfoliation. The sequestrum is encompassed by a broad and deep groove; its surface is uneven and porous, like the surface of bones just beneath ulcers of the integuments; and its border is black, from the application of the actual cautery. The sur-

rounding bone is indurated ; and new bone has been formed on its surface. The whole shaft is increased in weight. There had long been a deep ulcer of the integuments over the diseased part of the tibia. When the surface of the bone was exposed, the actual cautery was applied to accelerate its exfoliation. *Hunterian.*

1537. A tibia, on the surface of which there are several thin layers of new bone. On the anterior surface a part of the new bone is surrounded by a shallow ulcerated groove, having probably suffered necrosis. *Hunterian.*

1538. A tibia, on the inner surface of which there is a superficial oval ulcer, such as may have been left after the separation of sequestra like those shown in the preceding specimens. The adjacent part of the shaft is covered with a thin irregular layer of new bone. *Hunterian.*

1539. Part of a tibia, from the anterior surface of which a portion of the wall exfoliated, probably after such disease, produced by long-continued deep ulceration of the integuments over it, as is shown in the preceding specimens. Partial healing appears to have taken place. The surrounding part of the shaft is enlarged by thickening of its walls and formation of new bone upon them. The part of this new bone which is on the front of the tibia is light and finely porous.

1540. The remains of a tibia, from which large portions of the anterior wall and cancellous tissue have been removed ; it is uncertain whether by operation or by processes of disease. *Hunterian.*

1541. The remains of a tibia after removal of sequestra from its anterior wall and cancellous tissue. The surface of the shaft is superficially ulcerated. *Hunterian.*

1542. A sequestrum from the front of a tibia. The actual cautery and trepan had been employed to accelerate its separation. *Hunterian.*

1543. Two large portions of a tibia, exfoliated after a compound fracture followed by necrosis. *Hunterian.*

1544. A sequestrum, about six inches long and, through two inches of its length, comprising the whole thickness of the shaft of a tibia. It is marked "Exfoliation from the tibia of a girl 8 years of age, which was supplied with new bone, and now is well and walks." *Hunterian.*

1545. An oval sequestrum from the front of a tibia. Its outer surface is irregular, from superficial ulceration and formation of new bone. Its exfoliation was probably consequent on its being exposed by ulceration of the soft parts over it. *Hunterian.*

1546. Part of a fibula including upwards of four inches of the whole thickness of the shaft, which, having suffered necrosis, was in process of exfoliation. The shaft above the sequestrum is enlarged by the formation of new bone upon its surface. *Hunterian.*

1547. A portion of a child's fibula, about five inches long, exfoliated after a burn. It comprises nearly the whole thickness of the shaft. *Presented by John Ring, Esq.*

1548. The lower end of a fibula, of which the cancellous tissue and a great part of the wall of the outer malleolus have separated after necrosis. The sequestrum is loose in an incomplete cavity, chiefly formed of new bone; the whole of the lower end of the fibula is enlarged. *Hunterian.*

1549. The upper extremity of a fibula, from the interior of which exfoliations have taken place. The cavity which contained the sequestra is large; its walls are chiefly formed of new bone, and there are several apertures in them. *Hunterian.*

1550. The lower part of a fibula, from which the whole of the malleolus was in process of exfoliation after necrosis.

Hunterian.

1551. Part of a fibula. About the middle of the shaft a narrow groove passes irregularly around the wall, indicating that the bone below it had suffered necrosis. The other boundary of the dead portion is not obvious; but around the external malleolus there are several perforations as if produced by ulceration of the walls. Above the groove is a thin layer of new bone. *Hunterian.*

1552. The lower part of a fibula, a large portion of which has suffered necrosis, apparently after fracture. The dead bone is separated, but is held in its place by new bone formed around it. *Hunterian.*

1553. A similar specimen, except that the separation of the sequestrum is not complete. *Hunterian.*

1554. The upper extremity of a fibula, from the interior of which exfoliations have taken place. The cavity which contained the sequestra is large; its walls are chiefly formed of new bone; and there are several apertures in them. *Hunterian.*

Bones of the Foot.

1555. Parts of a tibia and fibula, with the bones of the foot, displaying the effects of necrosis of part of the cancellous tissue of the os calcis. Three small round apertures in the wall of the os calcis lead to a cavity in its interior containing a small sequestrum. Irregular formations of new bone have taken place about the ankle-joint, the sheaths of the tendons and the articulation between the os calcis and os cuboides.

From a woman 40 years old, in whom the disease had long existed. She recovered after amputation.

From the Museum of Robert Liston, Esq.

1556. Section of an os calcis, dried after the minute injection of its blood-vessels. A portion of the bone, separated after necrosis, lies loose in a cavity with very vascular walls; and another cavity, partially separated from the preceding, from which a sequestrum has probably been removed, is situated lower down and opens externally by a round aperture through the wall of the bone.

From the Museum of Sir A. P. Cooper.

1557. The other section of the same os calcis, together with the adjacent tissues and the integuments, not dried. The preparation shows, besides the conditions mentioned in the last description, a layer of granulations lining the cavity containing the sequestrum, and two small ulcerated apertures in the adjacent integuments.

From the Museum of Sir A. P. Cooper.

1558. The bones of a left tarsus and metatarsus. The os cuboides, black and necrosed, lies in a cavity formed by the surrounding bones, especially by the os calcis, which has been excavated to receive it. More than half of the outer cuneiform bone has been destroyed by caries; the middle and internal cuneiform bones are abnormally soft and porous. The astragalus and os calcis are united by bony ankylosis.

From a gentleman aged 50, subject to rheumatism. The left foot had been diseased for five-and-twenty years before amputation; and pus was from time to time let-out by incisions made in the neighbourhood of the ankle-joint. Then a sequestrum was removed from the os calcis, and the condition of the foot rapidly improved. A year later the patient received a kick near the seat of inflammation, and neglected to rest the injured limb. In a few days extensive inflammation of the deep structures of the foot set-in, the patient's health became impaired by free local suppuration, and within three months after the accident it was found necessary to remove the left foot by Syme's operation. The patient made a good recovery. The cavity in which the cuboid was lodged was full of pus and communicated with the integuments by numerous sinuses. (See Trans. Path. Soc. vol. xi. p. 197.)

Presented by T. Carr Jackson, Esq., 1860.

1559. An os calcis, of which a large portion of the posterior surface and contiguous cancellous tissue suffered necrosis and is partially separated. Much new bone has been formed around it, especially on the under surface.

The person from whom it was taken trod upon a copper nail, which entered so deeply as to require some force to extract it. Violent inflammation succeeded. After eleven months' suffering the foot was amputated.

Presented by Sir Stephen L. Hammick.

1560. An os calcis, the whole surface of which, except at the parts where it articulated with the astragalus and os cuboides, is rendered exceedingly irregular by ulceration and the heaping-up of large quantities of new bone. The changes appear to have been consequent on necrosis of many isolated portions of its tissue, of which some probably have been separated and others remain incompletely detached. The anterior articular surface is healthy; of the superior, much is destroyed by ulceration. *Hunterian.*

1561. An os calcis, in the posterior part of which there is a deep ulcerated cavity from which, probably, a sequestrum of cancellous tissue was discharged. The adjacent part of the bone is enlarged and thickly covered with new bone. The superior articular surface is superficially ulcerated.

1562. The lower end of a tibia with part of an astragalus. The upper half of the astragalus has been removed by ulceration. Its remaining portion, dead and deprived of its articular cartilages, lay loose in the ankle-joint. The cartilage has been removed from the articular surface of the tibia, and is replaced by a layer of vascular false membrane.

Hunterian.

1563. Parts of a tarsus and metatarsus. The scaphoid and one of the cuneiform bones, deprived of their articular cartilages and dead, lie loose in a cavity, the interior of which is covered with very vascular granulations. A large portion of the scaphoid bone has been removed by ulceration.

Another of the cuneiform bones has also separated after necrosis, and lies loose in a cavity near the sole.

Hunterian.

1564. The bones of a tarsus and metatarsus. The anterior parts of the os calcis and astragalus are carious ; a necrosed and detached portion of the anterior articular surface of the astragalus has been fixed in its normal position. The posterior portions of the cuboid and two outer cuneiform bones and the greater part of the scaphoid have been destroyed ; the inner cuneiform and metatarsal bones remain healthy.

Presented by Richard Quain, Esq.

1565. An internal cuneiform bone, and the proximal half of the metatarsal bone of a great toe. A portion of the cuneiform bone, incompletely detached after necrosis, lies in an ulcerated cavity, formed partly by the cuneiform bone and partly by the adjacent portion of the metatarsal bone. The corresponding parts of both bones are irregularly enlarged; and their articular surfaces are ulcerated.

The patient was a man twenty-five years old. The bones preserved were removed by operation ; but secondary hæmorrhage ensued and was followed by sloughing of the integuments, hectic fever, and death.

From the Museum of Robert Liston, Esq.

1566. A metatarsal bone, from some quadruped, enlarged in consequence either of necrosis, or of the collection of pus or some other substance, in its whole interior. Its walls are very thin, and are perforated by numberless minute rounded apertures and by a few of larger size ; their outer surface is in many places rough, through the formation of new bone ; the inner surface is nearly smooth. *Hunterian.*

1567. The bones of a great toe, with the metatarsal and internal cuneiform bones, amputated from a young person. There has been necrosis of the metatarsal bone, some portions of which are removed and others remain loose and detached. Its articular surfaces are destroyed. The corresponding

surfaces of the first phalanx and the internal cuneiform bone are very deeply ulcerated; and small quantities of new bone have been formed on their remains.

From the Museum of Robert Liston, Esq.

1568. The bones of a great toe, with its metatarsal bone. On the inner and inferior aspect of the latter, near its proximal extremity, is a deep irregular ulcerated cavity, at the bottom of which cancellous tissue, apparently healthy, is exposed. Portions of the metatarsal bone are partially separated after necrosis. The shaft is enlarged, and covered with new bone. There is a small exostosis on the outer margin of the distal extremity of the last phalanx.

Amputated from a woman thirty years old.

From the Museum of Robert Liston, Esq.

1569. Part of a great toe, in which several small portions of bone have been exfoliated from the distal extremity of the metatarsal bone. The bone adjacent to the dead pieces has been painted red. *Hunterian.*

1570. The bones of a great toe, with the distal end of the metatarsal bone. After necrosis of a part of the first phalanx, only its articular ends and the immediately adjacent parts of the shaft remain. In the interior of the proximal portion is a small sequestrum of cancellous tissue. The articular surface of this portion is healthy ; but that of the distal portion and the corresponding surface of the second phalanx are superficially ulcerated.

From the Museum of Robert Liston, Esq.

1571. The bones of a great toe. There has been necrosis of a portion of the cancellous tissue of the first phalanx; and the dead piece remains fixed at its proximal extremity, in an incomplete cavity formed by the inferior wall of the bone. The cavity has an aperture of communication with the metacarpal articulation and is wide open above, from the

destruction of nearly all the dorsal wall and distal extremity of the bone. The proximal end and articular surface of the last phalanx are destroyed. No new bone has been formed.

From the Museum of Robert Liston, Esq.

1572. The bones of a great toe, with the metatarsal bone. There has been necrosis (or, perhaps, only ulceration) of the metatarsal bone, and a large portion of its wall has been destroyed. A small portion of the bone lies nearly loose in a cavity with external openings, within which the greater part of the cancellous tissue of the shaft remains perfect. The surface of the remains of the shaft is covered with new bone. The articular surfaces and the other phalanges are healthy.

Amputated from a girl seventeen years old, in whom the disease had existed three months. Its origin was ascribed to a bruise.

From the Museum of Robert Liston, Esq.

1573. The bones of a great toe, with the metatarsal bone. The first phalanx and the metatarsal bone are so ankylosed that they appear to form a continuous shaft expanded at its middle. At their junction is a large cavity, with three wide external openings through the wall of the bones, in which a portion of the cancellous tissue, separated after necrosis, lies loose. The adjacent parts of the shafts are healthy and no new bone has been formed.

The disease had existed twenty-four years; and several portions of bone had been discharged. The diseased bones were first removed by dividing with cutting-forceps the metatarsal bone near its proximal end. This end was several days afterwards removed, in order to secure the anterior tibial artery, from which repeated hæmorrhages had occurred.

There is a drawing of the preparation in Mr. Liston's 'Practical Surgery,' p. 377, ed. 1846.

From the Museum of Robert Liston, Esq.

Many other illustrations of Inflammation of Bone are among the specimens of Fractures, especially those of compound and complicated fractures (see Index, p. 101), and among the preceding specimens of Ulceration and of Necrosis, especially Nos. 1338 to 1423.

Subseries 5. Tumours of Bone*.

Cartilaginous—Enchondroma: 1574 to 1589.
Osseous—Osteoma, Exostosis: 1590 to 1628.
Fibrous and Fibro-cartilaginous: 1629 to 1633.
Sarcoma—Embryo-tissue Tumours: 1634 to 1669; 3792.
Cancer—Carcinoma: 1670 to 1697.
Entozoa in Bone: 1698 to 1701.
Bones altered by the growth of Tumours: 1701 to 1725; 672 to 675.
Uncertain formations on Bones: 1726 to 1732.

Cartilaginous Tumours: Enchondroma, &c.

Typical: 1574 to 1577.
Partially ossified: 1578 to 1581, 1586, 1591, 1593, 1594.
With softening or mucoid degeneration: 1581 to 1583, 1585, 1587 to 1589.

1574. A finger, with a tumour growing from the palmar surface of its first phalanx. The tumour is nearly globular, about an inch and a half in diameter, and composed of pale, firm, semitransparent, and slightly vascular cartilage, like that of the fœtal skeleton, arranged in nodules, with partitions of fibro-cellular tissue. It appears to be connected with only the periosteum of the phalanx. In its growth the tumour has pushed aside the flexor tendons and their sheath.

From the Museum of Robert Liston, Esq.

1575. The bones of a little toe, with a tumour on the inferior surface of the first phalanx. The tumour, closely resembling the last described, is nearly globular and about an inch and a half in diameter. It consists of firm, grey cartilaginous substance intersected with tough, shining, fibrous bands, and is invested with a thin capsule of fibro-cellular tissue.

Removed from a young man, in whom the tumour had been growing for three years.

From the Museum of Robert Liston, Esq.

* In this and the following "Series," the tumours are arranged and named in the same manner as the "Tumours" in the Series of General Pathology. See Vol. I. p. 92; where, also, the chief synonyms of each tumour are given.

1576. A section of the finger of a child, with tumours of the first and second phalanges. The original tissue of the second phalanx is nearly destroyed by the growth of a cartilaginous tumour within and around it. This tumour is nearly globular in form, an inch in diameter, and smooth on its surface, which has a thin but complete covering of cellular tissue. Its texture is firm, pale, transparent and glistening ; and it is composed of numerous round portions connected by fibro-cellular tissue. The growths within and around the bone are continuous. A growth of the same nature, but not connected with the preceding, fills the distal extremity of the second phalanx. It has destroyed all the original cancellous tissue, and has just made its way through the dorsal wall of the bone. *Hunterian.*

1577. A section of a globular tumour, about three inches in diameter, growing from the second phalanx of a finger. The tumour is surrounded by a thin capsule of bone, an expansion of the external wall of the phalanx. The interior is composed of rounded nodules of cartilage, with interspaces containing cancellous bone-tissue and medulla. A similar growth appears to have commenced in the ungual phalanx. The skin covering the surface of the tumour is extensively ulcerated.

The remainder of the hand, on which are many similar tumours, is in the Museum of St. Bartholomew's Hospital.

Presented by Sir James Paget.

1578. A vertical section of the upper half of a tibia, with a large tumour at its posterior part. The tumour in its chief diameters measures about six and four inches ; it is of an irregularly rounded form, with a deeply nodulated surface, and is invested with a thin fibro-cellular capsule. The cut surface shows it to be composed of round and irregular masses of firm semitransparent bluish-white substance, like fœtal cartilage, variously grouped, and connected and intersected by strong fibrous bands. Within these bands are numerous blood-vessels, into which portions of bristles are

introduced. The upper part of the tumour, as well as several small portions of its interior, are osseous. In the former, the osseous tissue is compact, looks granular, and is continuous with the cancellous tissue of the head of the tibia, which is, also, more than usually compact. At this part, the wall of the bone, for about two inches below its upper margin, is deficient, being gradually lost in the ossified portion of the tumour ; and an inch lower down its outline is indistinct, having partially coalesced with another portion of bone formed in the adjacent part of the tumour. The rest of the tibia and its articular surface are healthy.

From the Museum of Joshua Brookes, Esq.

1579. A small portion of the exterior of the tumour last described, showing more clearly its composition of small masses, or nodules, of cartilage, in some of which bone of delicately cancellous texture has been formed.

1580. A similar preparation.

1581. A vertical section of a humerus, and of a great tumour formed around the superior three fourths of its shaft. The tumour is very like that in the preceding preparation, but much larger. It has an irregularly oval form, measures nearly ten inches in its greatest diameter, and is deeply lobed and nodulated on its surface. It is chiefly composed of round portions of pale semitransparent cartilage ; in some, especially the lower, parts of its interior there are irregular cavities, whose walls are formed of softened cartilage, looking like pale jelly ; in many other parts, cancellous osseous tissue has been formed. The tumour is in every part closely connected with the posterior and lateral walls of the humerus. At the upper part, where the tumour appears to have originated, the posterior wall of the humerus is destroyed, and there is complete and extensive continuity between its cancellous tissue and the osseous tissue of which the tumour is in this situation chiefly composed.

Lower down, the exterior of the wall of the humerus is obscure, having coalesced with the tissue of the tumour, but its internal surface is nearly perfect; and still lower the wall is uneven and vascular externally, but has not coalesced with the tumour, and seems only to have suffered from the pressure upon it. The anterior wall of the humerus is entire. The ulnar nerve, stretched over the front of the tumour, and the median nerve and brachial artery, which seem to be involved in its substance, are preserved. The vessels of the arm have been minutely injected; but the tumour shows scarcely any appearance of vascularity.

The patient was a surgeon in the Navy, in whom the tumour had been growing for nearly forty years. It had at last greatly impeded the motions of the joint, and produced extreme pain by its pressure upon the nerves and upon the side of the chest.

Amputation at the shoulder-joint was performed; and the patient recovered from the operation, but died two months afterwards with disease of the chest.

The account of the operation, and an engraving of the preparation, are given in Mr. Liston's 'Practical Surgery,' p. 373, ed. 1846.

From the Museum of Robert Liston, Esq.

1582. A hand, with a large tumour implicating the first phalanx and the distal half of the metacarpal bone of the second finger. The tumour is of an elongated oval form, and measures about four inches in its greatest diameter. Its exterior is smooth and covered by the expanded tendons and fibrous sheath of the finger. A section through its whole length and thickness shows that its exterior is composed of a pale, firm, and nearly homogeneous substance, but that internally it is much softer and its tissue has broken-up so as to leave an irregular cavity, which contained a soft substance and particles of bone. It is probably a cartilaginous tumour softened. The second and third phalanges of the same finger are thrust inwards by the tumour, so that they project from its inner side; but both they and the rest of the hand appear healthy.

The patient recovered after amputation.

From the Museum of Robert Liston, Esq.

1583. The bones of a great toe, from the under surface of which a nodulated, spheroidal, enchondromatous tumour has grown. It is connected with the adjoining extremities of both phalanges, and is continuous with their cancellated interior, the compact surface-layer of bone being completely destroyed at the point of contact. The section of the growth is of a pale grey colour, composed of nodules of hyaline cartilage, with more opaque and fibrous interspaces, giving it a mottled appearance. In some parts the tissue has undergone degeneration, giving rise to large irregular cavities, the soft contents of which have escaped. The nail is much distorted in form.

From a man 46 years of age. Amputation was performed, and the patient recovered.

Presented by Sir Stephen L. Hammick.

1584. Section of a humerus almost entirely enveloped in a large cartilaginous tumour which has invaded and destroyed part of its shaft. The tumour is composed of a large number of distinct lobules of cartilage, uniformly granular on section. The muscles and other soft structures are pushed outwards by the growth, which is partially, but not entirely, encapsuled.

From a man aged 24. Twelve years before the operation he first noticed an ill-defined swelling on the outer side of the arm about four inches below the shoulder. It was painless and grew slowly, but steadily; and the patient at last only sought relief on account of its inconvenient bulk. When removed the tumour measured 38 inches in circumference, and with the whole upper extremity it weighed 33 lb. 6 oz. The patient did well after amputation till the 18th day, when he had a rise of temperature, and died on the 25th day. (See 'Lancet,' i. 1878, p. 640; and for photographs of the patient before operation, see MS. Notes, vol. iii. p. 92.)

Presented by Edward Atkinson, Esq., Leeds, 1878.

1585. A large tumour (probably a cartilaginous tumour softened), originating in the acromion process and spine of the scapula, which, with the integuments and muscles over it, was removed by operation. The tumour, nearly hemispherical in form, and about six inches in diameter, is com-

posed of numerous small round masses of a pale, semi-transparent substance, like cartilage, held together by thick layers and bands of fibrous tissue. In its interior are several irregularly shaped cavities, which were filled with a glairy fluid. Its mode of connexion with the bone cannot now be discerned. The loose pieces at the bottom of the bottle are portions of the tumour and of the scapula.

The tumour was believed to have originated in several severe blows upon the shoulder. The patient died, three years after the operation, with a return of the disease.

From the Museum of Robert Liston, Esq.

1585 A. Portion of a cartilaginous tumour removed from the dorsal surface of the lower end of the radius of a lady aged 40.

The tumour was about the size of a small orange, and had been growing during fourteen years. It had always been painful, particularly when the hand was fatigued. It was somewhat nodulated on the surface, and of unequal hardness, its sides being evidently bony, while in the centre a certain degree of fluctuation could be distinguished, as if a fluid were confined within a strong membrane like parchment, pressure producing a kind of crepitation. The following description was given by Mr. Quekett of the microscopic characters of the tumour:—"The growth was made up chiefly of cartilage-cells in a state of rapid development, being so far a true enchondroma; in some parts there existed a collection of peculiar compound cells, containing a large number of nucleated cells, many of them in a state of change, undergoing spontaneous division, the absorption of the cell-walls being also in progress. In some parts of the tumour the deposition of bone-corpuscles had commenced, and in others had gone on until considerable patches of ossification had been completed. This ossification had taken place in the walls of the compound cells, so that in many cases small cysts of true bone had been formed. These cysts or cavities contained a gelatiniform fluid, in which floated oval cells of large size, full of minute granules similar to those found in the thickened fluid of ovarian cysts and sometimes in the gelatinous fluid of inflamed bursæ."—'Medical Times and Gazette,' Feb. 28, 1852.

Presented by Bransby B. Cooper, Esq.

1586. A left scapula, with parts of a clavicle and humerus. A very large cartilaginous and bony tumour almost entirely

envelops the scapula. It appears to have grown originally from the axillary border, and to have spread round both sides. The supraspinous fossa and greater part of the base are free. The tumour projects forwards on each side of the head of the humerus so as nearly to surround it. The greater part of the tumour is composed of solid bone with its cancellous tissue almost solidified as in 358; but the surface of the more rapidly growing parts, especially of the nodules projecting into the axillia, is cartilaginous.

From a man aged 40, in whom the tumour had been observed for two years before its removal, together with the scapula and upper extremity. The patient died on the second day after the operation. At the *post-mortem* examination the heart, liver, and kidneys were found fatty. (See 'Lancet,' vol. ii. 1867, p. 552.)

Presented by Sir W. Fergusson, Bart., 1867.

1587. The lower end of a femur, with the upper part of a tibia and surrounding structures, injected. The femur is encircled by a tumour, apparently subperiosteal, which has invaded the interior of the bone in front and the cavity of the knee-joint below. Its upper part is soft, somewhat granular in section, and under the microscope appeared to consist of mucoid tissue. The lower portion is more uniform, harder, and composed of cartilage.

From a girl aged 16; the tumour was removed by amputation through the upper third of the femur. She was much emaciated, but recovered perfectly from the operation. (See MS. Notes, vol. ii. p. 88.)

Presented by Arthur E. Durham, Esq., 1873.

1588. A section of the upper extremity and shaft of a tibia. The soft structures are healthy; the bone has become abnormally dense, especially below; and the upper and middle portion of the shaft is completely surrounded by a firm and solid tumour, of which the greater part lies in front. The tumour, which lies entirely between the bone and the periosteum, has a uniform yellowish surface, with minute opaque specks interspersed, which consist of calcareous matter. On microscopical examination the matrix of the

tumour was found to consist of fibro-cartilage, in some places undergoing mucoid degeneration. Large well-formed cells like those seen in cartilage were scattered over the matrix; their nuclei were mostly loaded with fat granules. In company with these cells were others, which were bipolar, as in myxomata, and numerous patches of calcareous deposit.

From a man aged 30, in whom the tumour had been noticed since he was ten years of age; it had increased rapidly during the last nine months before amputation. (See MS. Notes, vol. i. p. 431.)

Presented by Sir William Fergusson, 1872.

1589. A section of an enormous tumour, occupying the lower end of a femur and its entire shaft excepting two or three inches of the uppermost portion. The tumour presents an irregular surface of a pale yellowish colour, with numerous small cavities produced by softening of its substance. The shaft of the bone is broken and partly incorporated with the substance of the tumour, so that its outline is almost lost, even close above the condyles. The tumour projects into the popliteal space, behind the tibia. It is extensively calcified; but its softer parts, which mostly lie near its periphery, are composed, as microscopical examination has proved, of a hyaline matrix with cells, round and elongated, closely resembling those found in cartilage. This tumour is probably an advanced form of 1588, to which it bears a certain histological resemblance, excepting that it does not contain mucoid tissue.

Presented by Joseph Lister, Esq., 1878.

Osseous Tumours—Osteoma, Exostosis.

Partly Cartilaginous: 1591, 1593, 1594.
Chiefly Cancellous: 1590 to 1599.
Chiefly Compact or ivory-like: 1600 to 1608.
Tumour-like osseous growths:
External, as Exostoses: 1238, 1568, 1609 to 1616, 705, 707.
Internal; chiefly medullary or diploetic: 1617 to 1628; compare 649 to 656.

1590. A little finger, with a small globular tumour which has grown from the palmar surface of the distal end of the first phalanx. The tumour is chiefly composed of bone, arranged in a close cancellous tissue, and is invested with a thick fibro-cellular capsule.

From the Museum of Robert Liston, Esq.

1591. A nodulated tumour removed from the side of the left thumb, near the distal articulation. The nodules are cartilaginous externally, but the whole of their interior is bony.

From a man about 40 years of age. The tumour was situated in the soft tissue under the skin. It was not attached to bone, and had been growing seven years.

Presented by Sir W. Fergusson, 1871.

1592. The first phalanx of a finger, with two large irregular osseous tumours, one of which has grown from each side of it. They are composed of cancellous tissue, containing abundant medulla, and, for the most part, thinly covered with compact bone. They are uniformly united with the shaft of the phalanx, their walls being smoothly continuous.

Hunterian.

1593. An elongated bony growth, which was attached by a narrow base to the inner condyle of the femur. The external edge

is raised near each extremity into two prominent nodules. The section shows that the growth consists, chiefly, of soft cancellous bone filled with medulla, and that the more prominent parts are cartilaginous.

From a boy 14 years old. Three years before the removal of the tumour he received a blow from a cricket-ball on the inner side of and just above the knee. He experienced no inconvenience for twelve months, when he began to have pain when walking or flexing the knee, and he noticed a swelling. In a month, after a good deal of walking, the swelling increased. The tumour was removed; and the patient recovered.

Presented by John Hilton, Esq., 1864.

1594. An osseous tumour of irregular shape, with an expanded bilobed surface (which was tipped with cartilage, before maceration) and a broad, flattened base. It grew from the back of the femur immediately above the outer condyle. The tendon of the biceps glided over the saddle-shaped depression on the surface.

Presented by Edward Cock, Esq., 1864.

1595. The end of a great toe, with an osseous tumour, arising from the inner side of the extremity of the last phalanx, and displacing the nail. The surface of the tumour is covered only by a thin layer of integument.

1596. The last phalanx of a great toe, on the inner side of the extremity of which is a small tumour, composed of loose spongy bone, of a rounded form, with a narrow base of attachment: the adjacent part of the phalanx appears to have been more vascular than is natural.

From a man twenty-two years old.

1597. The last phalanx of a great toe, with a small osseous tumour growing from the inner side of its extremity. The tumour has a broad base of attachment; and its outer surface is flat, rough, and formed by cancellous bone. Upon this surface there was probably, previous to maceration, a layer of unossified cartilage.

1598. The last phalanx of one of the little toes, with a round smooth osseous tumour projecting from the upper surface of its extremity. The tumour is as large as the phalanx itself, and constricted at its middle.

The four preceding preparations are from the Museum of Robert Liston, Esq.

They are referred to by Mr. Liston in the paper in which he first described this form of exostosis, "On the Cure of Exostosis of the last Phalanges of the Toes by Excision of the Diseased Bone," in the Edinburgh Medical and Surgical Journal, vol. xxvi. p. 27, 1826.

1599. A tibia and fibula, with a large osseous tumour. The tumour has grown almost entirely from the anterior and lateral parts of the upper two thirds of the tibia. It is of an irregularly oval form, and measures ten inches from above downwards, about fourteen inches from side to side, and exactly a yard in its chief circumference. Its surface is for the most part smooth, evenly rounded, and covered with a very thin layer of compact osseous tissue. Its interior and a few parts of its surface are formed of coarse cancellous tissue, about as heavy as that of healthy bone, and containing abundant medulla. Its exterior is smoothly continuous with that of the tibia, the walls of which are expanded and everted around its base of attachment. The fibula is pushed outwards, and so compressed by the growth of the tumour that it is in some parts nearly two inches in width and only two lines in thickness.

The limb was amputated at St. Bartholomew's Hospital by Mr. Gay, and weighed, with the foot &c., forty-two pounds. The preparation is engraved (of half the real size) in Cheselden's 'Osteographia,' tab. 53. figs. 1, 2, 3; and there is a large painting of it in the Museum of Saint Bartholomew's Hospital.

Presented by William Long, Esq.

1600. A portion of the upper part of a frontal bone, on the anterior surface of which, near the middle, are two small lens-shaped osseous tumours. Their surfaces are dense,

polished, and as hard as ivory. Their margins are sharp, and project over their bases. *Hunterian.*

1601. Parts of a frontal and of a parietal bone, on the inner surface of which are several osseous growths. These growths are fixed on the inner table of the skull by broad bases; their exposed surfaces are irregularly nodulated; and they appear to be composed of hard osseous tissue. The dura mater is extended over them, and attenuated; in some parts, an attempt has been made to reflect it from them; but it appears to have been too firmly adherent; in other parts, recent lymph is deposited upon the inner surface of the dura mater. The largest of the osseous growths is beneath the coronal suture; it has an irregularly oval form, measuring about two inches in length, one inch in breadth, and at the most one third of an inch in thickness: the other growths are much smaller in all their dimensions. The texture of the bones of the skull appears natural; but in the temporal region there is a considerable increase of thickness, by development of the diploe; their external surface is healthy. A trephine has been applied at the part around which the chief deposit of lymph on the inner surface of the dura mater has taken place. *Hunterian.*

1602. An elongated, nodulated bony tumour from the orbit, about one inch in length. The extremity appears to have been separated from the larger portion of the tumour, like the articular extremity of a long bone.

From a man, æt. 40, under the care of Mr. Cock at Guy's Hospital, by whom it was removed. (See Surg. Reports of Guy's Hospital, 1870, No. 154.)

Presented by Edward Cock, Esq., 1874.

1603. Portion of a skull, with an osseous tumour. The tumour is of an irregularly rounded form, is deeply lobed, and nodulated on its surface, and measures about two inches and a half in its greatest diameter. It has for the most part the hardness and apparent structure of ivory, but in its central and posterior part is composed of very close can-

cellous tissue. It fills the frontal sinuses and the upper part of the left orbit, encroaches into the right orbit, and projects for nearly an inch on both the outer and the inner surfaces of the skull. It appears to have originated in the ethmoidal cells, or frontal sinuses, and in its growth to have displaced and destroyed by pressure the adjacent parts of the outer and inner tables of the skull and the inner wall of the orbit. On the anterior aspect two of its lobes have made their way through separate apertures in the outer table; the margins of these apertures are thin, and extended for a short distance over its surface. Just above the tumour, near the left temporal ridge of the frontal bone, is a small round flattened elevation of bone. *Hunterian.*

This preparation is engraved in Baillie's Morbid Anatomy, Fasc. x., pl. 1. fig. 2. (See also Home, in the Philosophical Transactions, vol. 89, 1799, p. 239.)

1604. An ivory-like exostosis of oval form removed from the angle of a lower jaw; its long diameter measures about half an inch. *Presented by John Hilton, Esq.*, 1864.

1605. Portion of an irregular ivory-like exostosis exfoliated from the forehead twelve years after its outer portion had been removed by sawing. The lower part of this fragment is rough and irregular; its superficial portion is broad and flat, and bears traces of the marks produced by sawing.

The growth was first observed when the patient was 20 years of age, and was accompanied with pains at the *back* of the head. Two years later it was as large as a walnut, and situated over the root of the nose, somewhat overhanging the right orbit. The part which projected above the level of the frontal bone was removed in March 1863 with great difficulty, owing to its extreme density. The wound healed, leaving a small sinus from which a serous fluid continued to exude. In June 1875 the patient returned to the Hospital with the specimen, which, having become loose, he had himself pulled out "by the roots." A large cavity remained, the floor of which presented a granulating surface. The upper part of the nasal bones, portions of the nasal processes of the superior maxillary bones and the spine of the frontal bone were absorbed. (See MS. Notes, vol. ii. p. 192.)

Presented by Edward Cock, Esq., 1875.

1606. The bones of a face, with bony tumours. The tumours consist of two large masses of almost exactly symmetrical form and arrangement, which have partially coalesced in the median line. They are of an irregularly rounded form, deeply lobed, and somewhat nodulated: they are nearly as hard and heavy as ivory; and their surfaces are perforated by numerous apertures, apparently for the transmission of blood-vessels. Their interior, as far as it is exposed, consists of a very close cancellous tissue, bearing a general resemblance to that of true bone. They project more than three inches in front of the face, and an inch on each side, beyond the malar bones; they completely fill both orbits, the cavities of the nose, and probably both the antra; and they extend backwards as far as the pterygoid plates of the sphenoid bone. There is scarcely any vestige of the form of the face, except in the deep groove which separates the two chief masses of the tumours and at the bottom of which a part of the septum of the nose is seen, and in the alveolar arch of the upper jaw, which remains perfect, with several teeth imbedded in it. It is probable that the disease producing these growths began in the superior maxillary bones, and thence extended to the other bones of the face, and, in a slight degree, to the left external angular process of the frontal bone.

The patient, a man sixty years of age, believed that the disease commenced eighteen years before his death, in consequence of repeated blows received on the face in fighting. He suffered, during the growth of the bones, much pain in the face, eyes, and head. His eyes projected from the orbits; the right eye, after suppuration and sloughing of the cornea, shrivelled; the left was accidentally burst by a blow while it was projecting and turgid with inflammation. During the last two years of his life he occasionally showed symptoms of insanity. At last he died suddenly with apoplexy.

All the cranial bones were thick and hard, and all their sutures were obliterated. Blood was effused beneath the cerebral arachnoid. The integuments of the face were greatly attenuated; the periosteal covering of the growths was dense and vascular.

From the Museum of George Langstaff, Esq.

1607. Sections of two vertebræ of a Cod fish (*Gadus Morrhua*) with a nearly spherical growth of compact hard bone, half

an inch in diameter, attached to their adjacent borders and surfaces. The surface of the tumour is lobed, but not deeply, and appears less compact than its interior.

From the Museum of George Langstaff, Esq.

1608. Several ribs of a Chameleon, each with one or more small oval tumours. These tumours were said to be the results of the union of fractures; but their number, even on the same rib, and their regularity of form, render that account very improbable. They have rather the appearance of circumscribed enlargements of the ribs; their exterior is compact and continuous with the outer wall of the rib; their interior is filled with cancellous tissue. *Hunterian.*

Tumour-like Osseous Growths—Diffuse Osteomata.

1609. A radius and ulna, without their epiphyses. They are of very light, brittle texture, atrophied and curved, probably by rickets. On the inner margin of the lower end of the radius is a spinous cylindriform growth of bone, with a broad expanding base, cancellous in its interior, but externally, except at its extremity, covered with a thin layer of compact bone continuous with the wall of the shaft. The middle of the outer margin of the ulna is prolonged in a thin broad ridge, the free border of which is unequally thickened and rests in a deep pit in the side of the radius. There is also a small pointed growth, like that on the radius, just beneath the coronoid process of the ulna.

The humerus of the same arm, with several similar ridges and projections, is preserved in No. 1621.

Hunterian.

1610. Sections of the upper part of a tibia, similarly diseased, and showing that the projections from its walls, like broad-based and ridged or pointed osseous tumours, are chiefly formed by the increase of healthy cancellous tissue and the extension of the walls. The walls of the shaft are very thin; and its texture is light and greasy.

The femur and humerus of the same person, similarly diseased, are preserved in Nos. 1623–4.

From the Museum of John Howship, Esq.

1611. Sections of part of a femur having on the middle of the anterior part of its shaft a growth of bone about five inches long and an inch wide, convex on its anterior surface, attached by a broad base. It is continuous with the surface of the shaft above and on its outer side, but on its inner side, and below, projects over the shaft with a sharp thin margin and a long pointed process. The sections of this growth show that it is composed of cancellous tissue, with an abundant medulla, covered in by a layer of compact tissue, half a line in thickness and continuous with the outer layers of the wall of the femur. *Hunterian.*

1612. A femur on the middle of the anterior part of which there is a flat broad-based growth of healthy bone. One edge of it is sharp, and overhangs the adjacent portion of the shaft; the other is smoothly continuous with the surface of the shaft. *Presented by Sir William Blizard.*

1613. Sections of a femur with a similar osseous outgrowth in the middle of the internal surface of its shaft. *Hunterian.*

1614. A femur with a similar but larger osseous growth upon the middle of its anterior surface. The tumour is flattened, and has a long base of attachment. *Hunterian.*

1615. Part of a femur with an osseous growth upon its outer and posterior margin just above the external condyle. The growth has the same characters as that last described, but is much larger. *Hunterian.*

1616. A femur, with a portion of the ischium, to which it is united by an arched growth of bone four inches long, an inch and a quarter wide, and half an inch thick, extending from the lesser trochanter to the tuber ischii. *Hunterian.*

1616 A. The skeleton of a man, 39 years of age, with numerous osseous growths, of various dimensions and extent. Some of these project from the bones like osseous tumours; others, passing from one part of the skeleton to another, have pro-

duced ankylosis of many of the joints. The growths like tumours may be observed on the os frontis, mastoid process, and occiput, and other parts of the skeleton where muscles are inserted, as:—near the angle of the lower jaw, where the masseter is inserted; at the extremities of the spines of the vertebræ; at the coronoid processes of the ulnæ; in the femur, at the part where the gluteus maximus is inserted, &c. The second and more extended kind of ossifications have in general followed the course of the larger muscles, and may be seen, on the right side, in the situation of the deltoid, joining the clavicle and the acromion of the scapula to the humerus; in the situation of the supra-spinatus; and passing from the inferior angle of the scapula to the humerus, in the situation of the teres major and latissimus dorsi. On the back, more extensive ossifications of the muscles appear, which affix the scapulæ on both sides to the sacrum and ilium, and to the spines of the lumbar and dorsal vertebræ. On the left scapula the ossification of the teres major has not extended quite to the humerus, but the dorsum presents a singular process or ossification, with smooth sides and a flattened overhanging margin, like an auxiliary or second spine. From the pelvis, ossifications extend from the sacrum and ilium in the direction of the gluteus maximus, and from the tuber ischii and os pubis, in the course of the biceps and triceps abductor muscles. These extend to the right femur. Ossifications of the tendinous and ligamentous parts appear to be still more common, producing ankylosis of the vertebræ, of the left elbow-joint, of the tibia and fibula to each other on both sides, of the ankle-joints, and general consolidation of the bones of the tarsi.

Hunterian.

1617. The right femur of a young person, on which a small sharp-edged ridge projects in front of the lesser trochanter. It is formed of cancellous tissue, thinly covered with compact bone. The whole of the shaft is very light and thin-walled. *Hunterian.*

1618. The left femur of the same person, on which a similar slight

ridge or elevation of cancellous bone, continuous with that of the medullary tube, is raised on the anterior and outer margin, just above the external condyle. *Hunterian.*

1619. The left tibia of the same person, on which there are several small pointed broad-based outgrowths of cancellous bone, thinly covered with compact tissue, near its upper end, and two of the same kind near its lower end. Of the latter, one seated on the posterior margin of the shaft forms a thin cylindriform process half an inch long. *Hunterian.*

1620. The right tibia of the same person, on which there are similar growths, like sharp ridges of bone, on the outer and posterior margin of the shaft. Not one of the growths on any of these bones is in the situation of the attachment of a tendon. They are all, like that first described, very light and thin-walled. *Hunterian.*

1621. A humerus of light texture, and presenting at its upper part several small ridges and projections, like those on the preceding bones. It is probably from the same patient. *Hunterian.*

1622. The upper half of a left femur, with some irregular spicular osseous outgrowths from the linea aspera and on the great trochanter.

From a man about 40 years of age, who died of psoas abscess.

Presented by Sir Stephen L. Hammick.

1623. A vertical section of the upper part of a femur, of which the neck is enlarged, especially at its lower and outer part. The enlargement is owing to an increase of the healthy cancellous tissue: the structure both of it and of the wall is light, weak, and greasy, but is in other respects unaltered. The external surface of the enlarged part is irregularly elevated in knobs and ridges, formed by outgrowths of the cancellous tissue thinly covered with compact bone, just like those in the preceding five specimens.

From the Museum of John Howship, Esq.

1624. A vertical section of a humerus, most probably from the same person as the preceding specimen, exhibiting, in a less degree, the enlargement of small portions of its shaft by increase of healthy cancellous tissue, the lightness and thinness of its walls, and the growth of a slender process of bone from the surface of one of the enlarged parts.

From the same Museum.

1625. The tibia of a Fowl enlarged, and having numerous irregular sharp-pointed growths of bone on its margins.

1626. Portions of the upper part of the skull of a maniac. The tables of parts of the occipital, parietal, and right temporal and frontal bones are widely separated by the formation of bone in the diploe. The separation, effected entirely by the elevation of the outer table, the inner table being unaltered, has formed a large smoothly rounded tumour upon the back and right side of the skull. The bone formed between the tables is hard and heavy, but delicately porous and spieulated. All the adjacent sutures are obliterated. In the right temporal and frontal bones the tumour is less prominent; but the bone here formed is solid, compact and heavy.

From the Museum of John Heaviside, Esq.

1627. A skull exhibiting similar elevations of the parietal and occipital bones. The principal elevation is on the left parietal bone. Similar disease has affected, to a small extent, the external angular proeesses and adjacent parts of the frontal bone; and there are very slight traces of its effects on the interior of the left parietal bone. *Purchased*, 1847.

1628. Part of a skull, with elevations of the middle portions of the parietal bones and of the upper part of the occipital bone, similar to those in the preceding specimens, but in a much less degree. The bone formed between and separating the tables of the skull is, in this case, more like natural diploe than that shown in the preceding; and herein the case resembles those illustrated in No. 649 and other instances of simple hypertrophy of the skull. But it differs from all those, in that there is no depression of the inner

table towards the cavity of the skull, as if in compensation for the diminished volume of an atrophied brain.

Presented by Sir William Blizard.

Fibrous or Fibro-cartilaginous Tumours.

1629. A vertical section of the knee-joint of a large Dog. A large tumour, composed of tough compact white fibrous tissue, has formed in the popliteal space, and is intimately connected with the periosteum of both the femur and the tibia. Small portions of osseous substance are imbedded in its interior; but the bones with which it is connected are healthy. *Hunterian.*

1630. A section of the lower end of a humerus, with a large tumour, growing apparently from, not beneath, the periosteum, on its anterior and inner part. The tumour is oval, five inches in its greatest diameter, and smooth on its surface. Its texture is nearly similar in every part, pale, and compact; it seems composed of a very dense fibrous tissue, variously intersected and imperfectly divided into lobes by curved and undulating small shining bands, so as to look somewhat like the central parts of an intervertebral fibro-cartilage. The broad base of the tumour is closely applied on the exterior of the humerus or its periosteum; but the bone itself appears healthy. *Hunterian.*

1631. A vertical antero-posterior section of the lower third of a femur, the upper part of a tibia, and a large tumour connected with them. All the articular portion of the femur appears to have been expanded or destroyed by the growth of the tumour within it. It measures about four inches in its chief depth, and six or seven inches in width from side to side. It is composed of a compact and somewhat glistening substance, traversed in many parts by short undulating white fibres. A few small oval cysts, with smooth internal walls, are imbedded in its interior; and in one part it is softened, and blood appears to have been diffused through it. The end of the shaft of the femur above the tumour is abruptly and roughly broken. The tibia is

healthy ; and the tissues around the tumour appear to be altered only by distention.

From the Museum of Robert Liston, Esq.

1632. The upper end of a fibula, surrounded by a lobulated tumour nearly four inches in diameter. The tissue of the tumour is for the most part pale, nearly homogeneous, and very firm ; it is arranged in round masses connected by fibrous tissue, having spicula of bone mixed with it, and closely resembling in form and arrangement those of some specimens of the fibro-cellular tumour. The tumour grows entirely from the exterior of the bone and has no communication with the knee-joint.

The patient, a man 22 years old, ascribed the disease to a severe blow received several months previously. The tumour, with the upper part of the fibula, was removed by operation : profuse hæmorrhage ensued ; and the formation of a large abscess under the fascia lata proved fatal.

From the Museum of Robert Liston, Esq.

1633. A finger, with a tumour on the palmar surface of the distal end of its first phalanx. The tumour is of an oval form, and composed of dense white tissue, like fibro-cartilage.

From the Museum of Robert Liston, Esq.

Sarcoma.

Myeloid : 1634 to 1638.
Probably Round-celled* : 1639 to 1647 A.
Ossifying, Osteo-sarcoma : 1648 to 1667.
Melanotic : 1668–69.

Myeloid Sarcoma.

1634. The distal ends of the shafts of the right radius and ulna of a woman. A tumour, about two inches in diameter, surrounds the radius immediately above the wrist-joint. Its surface is slightly nodular, and grooved by the pressure of the tendons passing over it. It is encased by a firm fibrous membrane apparently continuous with the periosteum. A section in the dorsal aspect shows the internal structure to

* See footnote, p. 370.

be soft, homogeneous, and cheese-like. It contained much blood when first cut into. Near the upper part is a cavity about one third of an inch in diameter, probably produced by degeneration of the substance of the tumour.

Presented by Bransby B. Cooper, Esq.

1635. "A section of a tumour, formed upon [or rather in] the head of the tibia, which gave an immense size seemingly to the joint of the knee. Besides the general volume given to the knee, there was a protuberance of the size of a large egg, which is become smooth, and of a bluish hue from the contents shining through, which is seen in the preparation. The leg was removed, and upon examination it [the tumour] was found to have arisen on the head of the tibia. It consisted of a great many cavities, or cells, filled with bloody serum, and even coagulated blood of long standing." —*Hunterian MS. Catalogue.*

That which intervenes between the cells is a pale and soft, almost brain-like substance, in parts of which blood appears to have been diffused. The head of the tibia has been so expanded by the growth of the tumour within it, that in this section none of the bone can be discerned.

1635 A. "Is the joint of the knee, with the head of the tibia, in which the before-mentioned tumour was formed, showing also where it is pushing into the cavity of the joint."—*Hunterian MS. Catalogue.*

The cartilage of the tibia, in the internal fossa, is elevated by the growth of the tumour beneath it.

1636. One half of the lower extremity of a femur, of which the walls are expanded by a sarcoma originating, apparently, between the diaphysis and epiphysis. The tumour was, in the recent state, of a pinkish yellow tint, mottled with patches of red from extravasated blood. The lower epiphysis of the femur has been separated from the diaphysis and displaced, in such a manner that its articular surface looks backwards and slightly downwards. The tumour projects most prominently forwards above the patella; but

although it has in some places perforated the expanded wall of the bone, it has not extended into the knee-joint.

Microscopically the morbid growth consists of closely crowded, round, and elongated cells, among which a few myeloid cells are interspersed.

The specimen was removed from a healthy man, aged 49, who, nine or ten months before the operation, first noticed some swelling and pain about the right knee-joint. The swelling very slowly and gradually increased, but without any marked exacerbation of pain; and he soon lost the use of the limb. When he first came under observation there was a rounded swelling at the upper part of the knee-joint, corresponding to the lower extremity of the femur, the leg was semi-flexed, displaced backwards and rotated outwards. By the gradual increase of the swelling above mentioned, the nature of the disease became apparent.

Presented by Thomas Smith, Esq., 1882.

1636 A. The bones and soft parts entering into the formation of a knee-joint divided vertically. The head of the tibia has, in great part, been destroyed by the growth of a sarcoma, which, apparently, made its way into the knee-joint, and subsequently invaded the lower extremity of the femur. Within the articular end of the femur is a large smooth-walled, loculated cavity, bounded by the compact tissue of the bone, and partially filled with a soft growth, having a reddish-yellow tint. This cavity communicates below with a large irregular space formed partly by the cavity of the joint and partly by the expanded walls of the head of the tibia; the tissues surrounding it are ragged and infiltrated with the new growth.

Externally the joint presents a smooth rounded swelling corresponding to the space above described.

The tumour consisted microscopically of small round cells with numerous myeloid cells interspersed: in some places there was a close network of blood-vessels as in 1647 A.

Presented by Sir William Fergusson, 1865.

1637. Section of a knee-joint. The patella appears to have been the seat of a cystic myeloid growth; for in its place there is an elongated oval mass of soft, brownish substance, with large

cysts in its lower half. The whole mass is surrounded with fibrous tissue of various thickness, containing small thin plates and fragments of bone, as if the patella and its investing tissues had been expanded around the morbid growth. The femur and tibia, and all the adjacent parts, are healthy, except that the synovial membrane is thickened where the tumour is in contact with it.

From the Museum of Sir A. P. Cooper.

1638. The upper parts of a tibia and fibula. By the growth of a tumour within it, the head of the tibia is enlarged, and its walls and periosteum are expanded into an osseous and membranous cyst. Through the unequal yielding and partial destruction of the walls of the bone, this cyst is of irregular form, and projects especially at the anterior and posterior parts. In these portions its walls consist of fibrous membrane alone, and have been laid open. It is partially filled with a soft granular substance, arranged in flakes and irregular bands and masses, the spaces between which were probably filled with fluid or coagulated blood. In its growth the tumour has destroyed the centre of the articular surface of the tibia, through which it projects for a short distance into the knee-joint, and, also, a small portion of the inner wall of the tubercle, where is a nearly circular aperture. The fibula and the articular cartilages (except in the situation already mentioned) are sound.

Presented by Sir William Blizard.

Sarcomata, probably round-celled.*

1639. A vertical section of the lower half of a femur and of a tumour connected with it. The tumour is situated on the exterior of the femur, and extends from the upper margin of the epiphysis about five inches up the inner side of the shaft. Its surface is superficially lobed, and is covered with a tough membrane, which appears to be continuous with the periosteum. It is composed in part of a greyish sub-

* See footnote, p. 370.

stance, nearly as firm as cartilage, and in greater part of a softer whitish substance; there are also some irregular cavities in it. In the corresponding part of the interior of the femur the cancellous tissue is filled with dense granular substance, which, when recent, was of a light brown colour. The upper limit of this change of structure is clearly marked, and is nearly opposite the upper margin of the tumour. The inner wall of the femur, on which the tumour rests, is sound, except at about the middle of the tumour, and at the lowest part, where, for a short distance, its clear outline is lost. In both these situations the morbid growths within and without the bone are continuous. All the rest of the bone is healthy.

From a lad 19 years old, in whom the tumour had been observed for nearly two years. He had no pain, but was in a state of great debility, and died after amputation.

From the Museum of Robert Liston, Esq.

1640. A longitudinal section of a clavicle, with a large tumour formed on it. The whole clavicle, with the exception of three quarters of an inch at its sternal end, was removed by operation, with the tumour and a large piece of the integuments over it. The tumour is of an oval form, and covers the whole of the upper and back part of the bone. It is composed of a moderately firm, pale, and obscurely fibrous substance, arranged in large lobes. The greater part of its base, which is firmer than the rest, is intimately connected with the periosteum; but at the posterior part the bone itself is involved, and its outer substance is broken up and confused with osseous spicula contained in the base of the tumour.

The patient was a young farmer, of strong constitution, in whom the disease had existed for fifteen months, and was attributed to a bruise on the clavicle. In less than four months after the operation (which is described in Mr. Liston's 'Practical Surgery,' p. 347, ed. 1846) the disease returned in the form of tumours in the neighbourhood of the cicatrix. One of these sloughed and produced a fungus, which bled most profusely; and the patient died after repeated hæmorrhages.

From the Museum of Robert Liston, Esq.

1641. A section of a knee-joint, injected. The lower end of the femur is surrounded by a soft, dark-coloured and rather flocculent tumour, which appears to have originated in or beneath the periosteum. It has grown chiefly from within outwards; but, although there is no interruption to the continuity of the shaft of the bone, the cancellous tissue is infiltrated with the new growth. The articular cartilage remains almost entire.

The patient, a healthy man, first felt pain in his knee six years before operation; but this ceased in two or three days. During the four succeeding years he had irregular attacks of pain in the knee, which at length began to feel stiff. Within two years later he sustained injuries to the knee on three occasions; after the last the knee began to enlarge, and continued steadily to increase in size and painfulness until the time of amputation.

The patient died with recurrent disease in the abdomen.

Presented by John Hilton, Esq., 1866.

1641 A. One half of a femur which has been divided vertically. The lower half of the shaft is surrounded by a sarcoma which reaches its greatest expansion immediately above the knee-joint. The upper portion of the shaft is also the seat of a similar but smaller growth, which is separated from the lower portion by an interval of about two inches. The cut surface of the tumour is fibrous and fleshy, and in some parts ossified; the fibres in those parts immediately surrounding the bone are placed vertically to its axis, and appear to be continuous with its substance. The wall of the femur is dense, and its medullary canal is filled with hard and porous bone.

The tumour consisted microscopically of very small round cells, which were, for the most part, included in the delicate meshes of a homogeneous connective tissue; its constituents, in their general arrangement, presented some resemblance to the matrix of newly-formed bone or callus in process of ossification.

The limb was removed by amputation at the hip-joint, from a girl aged 17 years, who, about five months previously, had suffered pain, and had noticed a swelling in the thigh. The patient died 102 days after the operation, with recurrent growths in the stump and pelvis.

Presented by John Couper, Esq., 1867.

1642. A section of a knee-joint and the surrounding structures, injected. A large tumour has grown in and around the lower end of the femur and extended into the knee-joint. The bone is broken immediately above the tumour, which is chiefly composed of extremely hard bone, but anteriorly is soft and brain-like.

From a lady, aged 23, of delicate constitution. A fortnight after recovery from confinement she was attacked with a severe rigor. A week afterwards the left knee became painful, but notwithstanding this she walked about. A variety of local applications were made to the joint, which contained a good deal of fluid, and continued to enlarge in spite of treatment, with more or less constant and severe pain. The patient again had rigors and rapidly became emaciated. Amputation was resorted to about four months after the first appearance of the swelling; she made a rapid convalescence, but died a few months later. (See MS. Notes, vol. i. p. 65.)

Presented by W. G. O'Grady, Esq., 1866.

1643. The greater part of a right tibia, seen in section, showing a large tumour of a dead-white colour completely surrounding it. Anteriorly the tumour appears to lie between the bone and periosteum; behind, it has extensively invaded the muscles, and may be seen to encroach on the substance of the gastrocnemius and soleus without any capsule or other perceptible barrier to separate it from the muscular tissue. The bone is healthy, except that the compact tissue is thicker than normal. On microscopical examination the tumour proved to be a round-celled sarcoma.

From a man aged 49. The tumour was first noticed two years before the amputation; and it enlarged gradually without pain. The glands in the groin and deep inguinal region were enlarged; these subsided considerably after the operation. (See MS. Notes, vol. ii. p. 106.)

Presented by Arthur E. Durham, Esq., 1874.

1644. Part of a femur, of which the neck and nearly four inches of the shaft are enclosed in a large irregularly oval tumour, superficially knobbed and nodulated. The outer surface of the tumour appears to have been loosely attached to the adjacent tissues; its interior is fixed close to the femur, or its periosteum. In substance it is pale, firm, obscurely

fibrous, and bears much resemblance to No. 1641 A. The portion of the femur enclosed by it appears in part absorbed; what remains was fractured by a slight force and is dispersed in fragments through the morbid growth. Near the lower boundary of the principal tumour, flattened and lobed masses, apparently of similar substance, are attached to the shaft of the femur, between the bone and periosteum.

The patient, a man 48 years old, had lived freely, and had been dyspeptic.

"From the commencement of June 1845, he complained of rheumatism. On the 26th of that month he was out on horseback and, in riding down a bank, his horse made a false step, but did not come down, nor was the rider unseated. From that moment he suffered the most excruciating pain in the centre and inner part of the right thigh, and became wholly disabled, so that three men could hardly lift him from his saddle. He was carried to his home—a distance of two miles—in unmitigated agony. I then visited him, and he referred his intense sufferings to the middle and inner part of the thigh. The least motion of the limb was attended with extreme pain, and with violent spasms, amounting to rigidity, of the adductor muscles. For three days and nights he could not be moved off the sofa on which he was first laid. During this time the limb exhibited no external appearance of disease. On the 29th the symptoms abated; and by the 12th of July he was able to hobble with the aid of a stick. On the latter date he unawares caught the rug with the toe of the lame foot; and this accident, though he did not fall, immediately brought on a recurrence of all the pain and severe symptoms. The violence of the second attack gradually subsided; and by the 22nd of July he was again able to hobble, and appeared to be recovering. On the 23rd he went out in a gig. On the 24th he was out for a long time, and on his return he was obliged to be lifted out of the gig. On the 29th his sufferings had become so intense that he could not be moved from his chair for the following eleven days, and could not endure any other alteration of his posture than was afforded by a movable back to his chair. During this period I observed, for the first time, that the upper portion of the right thigh was enlarged, as if from thickened periosteum. The swelling gradually increased; and he became so exhausted and his ankles so swollen, that I advised his removal to bed. This was done with the greatest care; he was raised by loops and pulleys; but, notwithstanding every method for accomplishing it easily, his exclamations of pain were indescribable. When in the act of placing him in bed a crepitus was felt in the upper part of the right thigh-bone. The limb ever afterwards lay loose and powerless, and became shortened by about two inches. On four or five occasions, subsequently, we effected his removal to

the bed-side by the aid of pulleys and slides; but with those exceptions he continued in bed, not admitting of the least possible movement of the limb, until he was gradually worn out by suffering, and died, after five days' unconsciousness, on the 14th of September."

Presented, with the history, by William Irving, Esq.

1645. A section of a knee-joint, with the greater part of the tibia and part of the femur, injected. Near the upper end of the tibia is a large circumscribed brain-like tumour, which has completely destroyed the shaft for a space of nearly three inches, and projects both in front of and still more behind it. In the upper part, within the cancellous structure of the bone, the tumour is cystic in character. The lower part is broken down and shreddy. The growth was reported to "present the microscopical appearances of cancer."

From a man aged 23. Twelve months before operation the limb became swollen and painful; the pain and swelling increased; and ten months later the patient took to his bed; the bone gave way suddenly when he was walking across the room. Amputation was performed a short distance above the knee. (See MS. Notes, vol. i. p. 76.)

Presented by John Hilton, Esq., 1866.

1646. A section of a humerus, the shaft of which is fractured near its lower extremity and is surrounded by a soft sarcoma. The cut surface of the tumour is of a uniform dull yellow colour, and shows signs of breaking-down of its tissue at many points. The surrounding muscles are involved in the tumour, which has also invaded the bone below.

From a woman aged 48. She fractured the bone four months before amputation. A tumour was first observed soon after the accident; and the fracture remained ununited.

1647. Part of the left upper extremity of a child, injected, with the humerus laid open. The bone is completely surrounded and invaded by an elongated and slightly lobulated tumour, so that the cartilaginous extremities alone can be distinguished. The tumour is soft, of a uniform pale-brown

colour, and very vascular in parts. On microscopical examination it appeared to be made up of granular matter mixed up with large cells of irregular shape.

From a girl aged 7, otherwise healthy. The disease was ascribed to a fall, after which the bone was at first thought to be fractured: but swelling increased rapidly with much pain. The limb was amputated four months after the injury. No glandular enlargements existed in the axilla or neck. The patient died four months after the operation; and both lungs were found infiltrated with new growths. (See MS. Notes, vol. i. p. 82, and Preparation 3419.)

Presented by Edward Cock, Esq., 1866.

1647 A. A vertical, antero-posterior section of the lower two thirds of a femur, and of the upper part of a tibia, with the adjacent parts. A great portion of the lower third of the femur has been expanded by the growth of a large tumour. The tumour is nearly spherical in its form, and measures four inches and a half in diameter. Its interior consists of large cysts, irregular in shape, with tough membranous and, in some places, partially osseous walls, which were filled with blood, and between some of which there is a pale firm substance. It is surrounded by a thin membranous and osseous wall, composed of the expanded osseous tissue and periosteum of the original shaft. At the posterior part of the tumour there is a mass of pale-pink new growth, in which many tortuous channels, as of vessels, are imbedded. The new growth is composed of small round cells and fibrous tissue, which is undergoing ossification. It is traversed by very numerous blood-vessels, by the dilatation of which the cysts may have been formed. Above and below, the tumour is bounded by the shaft and condyles of the femur: in the former situation the walls are expanded by a separation of their laminæ; in the latter the cancellous tissue appears healthy. The knee-joint and the other surrounding parts, also, are healthy.

The following history of the case was sent with the preparation by James Luke, Esq.:—

"The patient, John Wilham, ætat. 20, a sailor, from whom the cystic disease of the thigh was removed, was admitted into the London Hospital January 21st, 1843. Shortly after leaving Cal-

cutta his thigh was fractured, July 18th, 1842, by a slip on the wet deck of a ship, there having been no previous suspicion of disease. By this he was confined during seven weeks, at the end of which it was found to be united. At the expiration of a month the thigh became again fractured in the same part, by a fall over a cable. After the lapse of eight weeks he was again allowed to move about on crutches; but in the middle of November the fractured parts had become separated a second time, and had rendered confinement necessary up to the period of his admission.

"When admitted, the fracture had united, but unevenly, and with shortening of the thigh to the extent of an inch. The fractured part was obscured by a tumour, which involved its posterior and lateral parts. The nature of this tumour was doubtful. It was generally elastic, but hard at certain parts, and fluctuated obscurely when examined. It was ascertained that it had not any pulsation. After admission the tumour increased in magnitude, and became very painful, and fluctuated more distinctly under examination.

"January 28th.—A grooved needle was introduced into the outer part of the tumour, along the groove of which a jet of blood flowed, which quickly coagulated. On making a careful examination a uniform pulsation was now detected over its whole surface, and the suspicion of its being aneurismal was raised. A consultation being called, the femoral artery was immediately tied. Upon drawing the ligature tight the measurement of the tumour became diminished to the extent of an inch in its circumference.

"February 6th.—He has gone on favourably, and to-day the ligature was removed.

"February 25th.—During the last few days the tumour has somewhat enlarged; and fluctuation is more distinctly observable in it than before the operation. There is not any pulsation, but some pain. It was suspected that suppuration had taken place, and a grooved needle was again introduced; bloody serum only escaped by the groove.

"March 22nd.—The tumour has increased much, is now very painful, and disturbs his rest. His health suffers greatly, and he has become very emaciated. The veins on the surface of the tumour are perceptibly enlarged; and the condyles of the femur appear to be expanded. At this period it was thought expedient that amputation should be performed, which, after a little delay, was done on March 30th. The surface of the stump bled profusely, and upwards of forty arteries required ligature. The medullary artery was greatly enlarged, and threw out a jet of blood to some distance. From the period of the amputation the progress was satisfactory, although slow. He left the hospital in the latter part of May with the stump perfectly healed, and well in every other respect.

"The other section of the parts is in the Museum of the London Hospital. Besides appearances similar to those shown in this section, it shows the femoral artery in close contact with the

tumour, but of healthy size and texture, and not giving-off any large branch to the substance of the tumour."

Presented by James Luke, Esq.

Ossifying Sarcoma; Osteo-sarcoma; Osteoid Tumour.

1648. A section, comprising about the half of a femur and a tumour, macerated and dried. The tumour measures ten inches in length and five in breadth. It completely surrounds the femur, but is most prominent posteriorly; the lower part of the posterior wall of the shaft is lost in it; and that of the anterior wall is imperfect. The central part of the tumour consists of hard bone; but it has neither the peculiar hardness nor the polish of ivory, like some of the osseous tumours already described: rather, it resembles the cut surface of chalk. The surrounding substance of the tumour is softer; and its softness increases towards its surface, where it presents (what is more obscurely seen in the deeper parts) a fibrous and fasciculated appearance, due to very thin plates of bone, so arranged that their edges or sections look like fibres in close bundles radiating outwards. At the surface, also, the tumour is very soft and friable: a piece of it may be easily rubbed into such fine dust as lies at the bottom of the bottle, like powdered chalk or pumice-stone. A canal, nearly half an inch wide, which probably enclosed the sciatic nerve, traverses the whole length of the tumour from above downwards, passing through its central hardest part; and by its side is part of another, smaller canal, through which, probably, the popliteal vessels ran, for on the exterior of the tumour there is not any appearance of a groove in which they could have lain.

Hunterian.

Other specimens from the same patient are described, with the history of the case, in Vol. I. pp. 165–6.

1649. Section of one of the condyles of the same femur, with part of its articular cartilage. Nearly the whole of its medullary substance is replaced by solid hard bone, like that in No. 1648. The articular cartilage is healthy and retains its natural form, but is not firmly connected with the diseased bone. *Hunterian.*

1650. Another section of the same femur. *Hunterian.*

1651. The ribs, with the dorsal and some of the lumbar vertebræ, of the patient from whom the femur last described was removed. Broad and thick irregularly nodulated plates of bone are attached to the inner surfaces of several of the ribs on both sides, near the vertebral column. On each side the plate of bone is about six inches in width, and in parts nearly two inches in depth. A similar but smaller plate of bone is fixed on the front of the eleventh dorsal vertebra. All the bone has the same apparent structure as that of the external parts of the tumour on the femur. *Hunterian.*

1652. The lower half of a femur, surrounded and filled with a large, heavy, and very irregular osteo-sarcoma, which bears a close resemblance to the preceding tumours.
Hunterian.

1653. Sections of a hard and heavy osteo-sarcoma, like the preceding. It is not known from what part it was removed.
Hunterian.

1654. A tibia and fibula, with pieces of a large osteo-sarcoma, in which the head of the fibula was imbedded. The bone composing these pieces of the tumour is hard and heavy, but brittle, and capable of being easily rubbed to powder. In its general arrangement it resembles bundles of fibres variously interlaced and heaped together; and hence its surface derives a fasciculated appearance, resembling that of some preceding specimens. The upper part of the fibula is lost in the tumour; the rest of its shaft, and such parts of that of the tibia as appear to have been in contact with the tumour, are thinly covered with new bone of ordinary character.

1655. The lower half of a femur and the upper halves of a tibia and fibula, together with a large, elongated, oval osteo-sarcoma. The tumour is attached to nearly the whole of the posterior and lateral surfaces of the lower third of the femur, and to the ends of the tibia and fibula, so that it surrounds and has immovably fixed the knee-joint. Its base is rather constricted: and at the upper part it far overlaps the femur. A part of it also extends from the front into the cavity of the joint, impacted between the heads of the femur and tibia. Like the preceding specimens, the tumour is composed of a hard and heavy, dry, osseous substance, arranged so as to present a coarsely fibrous aspect; and its surface is uneven and fasciculated, bundles of osseous fibres running in various directions on it. It measures ten inches in its extreme length, and nearly three inches in its greatest thickness. The femur, near the part to which the growth of bone is fixed, appears healthy in its texture, but is rather enlarged. The popliteal artery, vein, and nerve are shown passing over the surface of the growth, and in one situation running through it. The posterior tibial and peroneal veins are distended and varicose.

The patient was a strong muscular wheelwright, forty-five years old. He ascribed the disease to a blow received five years before the limb was removed, while he was in the army. The knee-joint regularly and slowly enlarged, and at last became the seat of severe pain, like that of neuralgia. The leg also became very œdematous. The limb was therefore amputated. In the operation the femoral vein bled profusely and very obstinately; but the patient recovered, and remained well for five years, at the end of which he began to suffer severe attacks of pain in the stump, and an enlargement at the inner side of the remaining part of the femur was felt. These increased, and a second amputation was performed. The femoral vein again bled as much as before; but the patient again recovered speedily from the effects of the operation. The stump of the femur removed in the second amputation is the next-described specimen.

From the Museum of George Langstaff, Esq.

1656. The stump of the femur mentioned in the preceding description, with an osteo-sarcoma formed by its inner side. The stump is quite healthy, and the tumour is not attached to it, but appeared to be intimately connected with the outer

surface of the periosteum. The tumour is very irregular in its form, about four inches in length, and three inches in its greatest breadth and thickness. It has the same fibrous and fasciculated appearance, and the same general plan of structure as that in the preceding preparation : the femoral artery runs through its middle.

Two years after the second amputation, a similar growth began to form about the stump. It regularly increased, but although sometimes painful, and producing much inconvenience by its increasing size, it did not materially affect the patient's general health, and he was able to pursue his business actively and was strong and robust for fourteen years after the second amputation. The integuments over the tumour then beginning to inflame and slough, he died, nearly twenty-five years after the commencement of the disease. The tumour with which he died is shown in the next specimen.

1657. The mass of osteo-sarcoma referred to in the preceding history. It is of an irregularly roundish form, and presents the same fasciculated and fibrous appearance on its surface, and the same soft, friable, and crumbling texture, as many of the preceding tumours do. It measures twenty-nine inches in circumference. The remains of the femur are lost in it; and it involves nearly the whole of the os innominatum. Parts of the ischium and ilium may be traced by their external forms ; but they are nearly covered with osseous growths, and contain the same kind of morbid osseous structure in their cancellous tissue.

Presented by William R. Barlow, Esq.

1658. Vertical sections of an ulna and radius and of the lower part of a humerus. The upper half of the ulna is surrounded by a sarcoma of elongated oval form, composed of dense fibrous and osseous substance. The osseous portion of the tumour is arranged in long fibres and lamellæ, which appear to radiate from the exterior of the ulna, and between which the interspaces are filled with the fibrous tissue. The outer surface of the tumour is nearly smooth, and is covered with a dense fibrous tissue, like a periosteum. The outline of the wall of the ulna is for the most part distinct, though

the tumour is closely connected with it; but at its upper and anterior parts the tissue of the shaft seems to have coalesced with that of the tumour, and the boundary-line between them is obscure. The cancellous tissue of the ulna at the same part is compact and dense, as if occupied by a substance similar to that of the hardest part of the tumour. The radius and humerus are healthy; and the articular surface of the ulna, as well as the rest of the elbow-joint, is unaffected by the disease.

The patient was a man twenty-four years old, in whom the tumour had grown slowly for two years. He recovered after amputation.

From the Museum of Robert Liston, Esq.

1659. A fibula, with parts of one or more large osteo-sarcomatous tumours which were developed upon the upper half of its shaft. The parts having been macerated, all that remains of the tumour consists of masses of light and friable grey sponge-like bone, arranged in filaments and delicate lamellæ, which, for the most part, radiate or are set vertically upon the shaft, and which, though much less dense, closely resemble, in both arrangement and general appearance, those in No. 1648. The largest of these masses is in the form of a circular disk, about six inches in diameter, which was attached to the outer side of the fibula; the other smaller masses were fixed around it and completely enclosed it. The shaft of the fibula is entire; but its upper part is covered with fine osseous lamellæ, from which the masses of bone have been detached; on its lower part is a layer of new bone.

Presented by Sir William Blizard.

1660. Section of the right parietal and temporal bones of a young woman, with a tumour on each of their surfaces. The tumour on the outer surface was nearly circular and lens-shaped, measuring about an inch and a half in diameter, and half an inch in its greatest depth. It is composed of bone and some firm tissue, the section of which has a pale and nearly uniform fibrous glistening aspect. The bone is

arranged in fine fibres, which are set vertically upon the surface of the skull, and are covered with a thin smooth layer of the other substance. The tumour in the interior of the bones is of the same form and nature ; but the layer of unossified substance on its surface is thinner, and it is somewhat smaller. The lines of boundary between these tumours and the surfaces of the bones are distinct ; and the bones themselves are healthy, though, when recent, they were unnaturally vascular. *Hunterian.*

1661. The other section of the same bones and tumours, after maceration, showing that the osseous portion of the latter is chiefly composed of very fine close-set vertical fibrils, like those of an osteo-sarcomatous tumour. The external tumour has been separated from the skull ; but the internal one adheres ; and small patches of osseous fibres, set vertically upon the skull around the chief mass, show that the whole tumour was composed of several smaller portions.

The following history of the case is published by Sir Everard Home, from the Hunterian MS. ; and there is a drawing of the preparation, in " Cases and Observations, which show that Inflammation is sometimes communicated from the Dura Mater to the Pericranium," in the ' Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge,' vol. iii. p. 153 (London, 1812).

" A woman, twenty-five years of age, in May 1806 was seized with a pain in her stomach, and a confined state of her bowels. These symptoms were relieved by proper medicines, and she returned to her employment, as a housemaid, in a fortnight. In the course of a month the same symptoms returned, conjoined with a pain in her back and feet, but more particularly in the latter. The symptoms became worse ; and a paralysis of the bladder took place. She had no stools but from glysters, as medicines given by the mouth had no effect on her bowels.

" The only cause to which these complaints could be referred, was a tumour on the right parietal bone, which had appeared when she was first attacked, and had increased ever since.

" After suffering severely for three weeks, principally from the pains in her feet, she died.

" On examining the body no unusual appearance could be discovered in any part except the skull. The tumour projected about half an inch above the bone, on the outside ; and there was a similar tumour placed exactly opposite on the inside of the skull, projecting the same distance inwards, and pressing on the middle lobe of

the cerebrum. These tumours were of a fibrous, bony structure; they were simply in contact with the cranium, having no adhesion to it; and the cranium was sound between them, only unusually vascular."

Hunterian.

1662. Portion of the right side of a frontal bone, with an osteo-sarcoma, like that last described, growing from its outer surface. The tumour, through which a vertical section has been made, was oval in its outline and evenly convex upon its surface. It measured an inch and a half in its chief diameter, and rather more than half an inch in depth. Its deeper and principal portion is composed of small plates and fibres of bone set vertically, and somewhat radiating, upon the surface of the skull; the rest is composed of a tough pale substance, like fibrous tissue, which covers all its surface, and dips down and fills all the spaces between the plates and fibres of the osseous substance. The base of the tumour is entirely osseous, and very dense; the skull beneath it also appears increased in density; and the diploe is consolidated. On the corresponding part of the internal surface of the skull there are projecting points and fibres of bone, but no regularly formed tumour. To the surface of this part a portion of dura mater is adherent, together with a small portion of the right hemisphere of the brain, the whole of which is said to have been "converted into a fibro-granular structure." Another portion of brain, similarly altered, lies loose in the bottle. It looks like a mass of fine blood-vessels and filamentous tissue, such as might be produced by complete removal of the nervous substance of the brain.

From the Museum of R. B. Walker, Esq.

1663. The other section of the same frontal bone, macerated. The laminated and radiating fibrous arrangement of the osseous part of the tumour, the hardness of its base and of the subjacent bone, and the roughness of the corresponding internal surface of the skull are well shown. It is here also seen that a similar roughness extends over much of the adjacent bone and over the lower surface of the orbital plate,

which are covered with points and spicula of bone, deposited on them like a hoar-frost.

The patient was a gentleman forty-five years old. Twelve months before his death his sight became bad, and in three months he was amaurotic in both eyes. Two months after this the tumour on the skull first appeared; and it gradually increased till he died comatose. No organic disease was found in the eyes.

From the Museum of R. B. Walker, Esq.

1664. A skull with a smooth rounded projection of bone, one inch and a half in diameter, from the middle of the frontal bone, in front of the coronal suture. The section shows that the tables of the skull have been widely separated and the external table upraised, probably, by the growth of a sarcomatous tumour in the diploe. The space between the tables is partly filled with very porous bone; and the internal table, which is projected slightly inwards, is here becoming porous.

From a Cingalese. See 'Thesaurus Craniorum,' No. 1007, p. 133.

From the Barnard Davis Collection. Purchased 1880.

1665. The osseous matrix of the horn of an Ox, on the extremity of which is a large bony tumour, closely resembling the lighter forms of osteo-sarcomata. Its substance is dry, brittle, light, porous, finely laminated and filamentous; it looks as if composed of slender grey osseous fibres radiating in tufts from the end of the matrix, with which its tissue has completely coalesced. *Hunterian.*

1666. The rib of a Horse, surrounded through nearly its whole length with a thick irregular growth of dry, light, and porous bone, like the osseous part of an osteo-sarcomatous tumour. The substance of the rib is involved in the growth; and at one end its outer surface seems to be expanded into that of the tumour. On the surface of the tumour there are numerous large round and oval apertures leading directly, or by sinuous canals, into its interior. *Hunterian.*

1667. Three ribs of a Horse, exhibiting a less extent of a similar disease. On that rib in which the disease is most advanced there is an elongated oval tumour, about six inches long. It presents the same general characters as that in the preceding preparation, and shows more evidently that the growth commenced within the rib and expanded its walls. In the rib which is least diseased the posterior wall is entire, the anterior wall and margins alone are expanded round the growth. In all these cases the growth appears to have commenced near the vertebral end of the rib, and thence to have extended towards the sternal end.

Presented by Sir William Blizard.

Melanotic Sarcoma.

1668. Sections of two dorsal vertebræ, in the interior of which a melanotic tumour is situated. The cancellous tissue is not apparently altered, except in its colour. A large quantity of melanotic matter is also deposited in the fibrous tissue on the front of the vertebræ.

The history of the case is with the description of No. 461, in Vol. I. p. 172.

From the Museum of George Langstaff, Esq.

1669. Part of a sternum, from the same patient, with melanotic matter in its interior. There are also deposits of a similar material in masses, forming small tumours, beneath the fibrous tissue covering the sternum.

From the Museum of George Langstaff, Esq.

Cancer.

Scirrhous: 1670 to 1676.
Medullary: 1677 to 1696.
Colloid. See specimens of Colloid Degeneration of Tumours of the Jaws, Nos. 2198 to 2204.
Cancerous Ulceration: 1334 to 1337.

Scirrhous Cancer.

1670. A portion of the condyles of a femur. The osseous tissue has been completely removed; and, without any change of form, its place is occupied by a very firm, elastic, pale brownish substance, traversed by white fibres, the arrangement of which bears a resemblance to that of the original cancelli. The articular cartilage is thin, and its external surface is irregular; its inner surface is detached from the morbid substance, and is smooth and healthy.

The patient was a lady of middle age, from whom a carcinomatous breast was removed in April 1794. She remained apparently well for a year, when another tumour appeared in the situation of the cicatrix. This, with all the parts for a considerable distance around it, was removed in the beginning of 1796; and there was no return of the disease till 1803, when the cicatrix became again the seat of cancerous disease. No further operation was performed, and in 1805 the patient was attacked by violent pain and swelling in the left knee. As soon as this occurred the disease of the breast became painless, and ceased to make progress. The new affection was supposed to be rheumatism, and was treated accordingly, with some disadvantage; but at length the swelling and pain subsided, and at the same time the patient became subject to extreme pain in the back and pelvis, with which she died exhausted.

After death the cancerous disease of the breast was found closely fixed to the ribs, but not involving them. The left knee-joint contained a large quantity of fluid. The articular cartilages were all thin; and of the semilunar cartilages scarcely a trace could be found. There was cancerous disease of the left ovary and of the lumbar glands of the same side*.

Presented by William Long, Esq.

1671. A vertical section of the head and upper part of a femur, nearly all the medullary tissue of which is filled with a

* From a paper by Mr. Long, in the "Minutes of the Board of Curators," July 8th, 1807.

compact yellow and grey semitransparent cancerous substance, with an appearance of short white fibres traversing it, and altogether very closely resembling the common hard cancer of the female breast. The form of the bone is scarcely altered; its walls are very thin; the shaft was broken an inch below the trochanter minor, and is reunited by a tough ligamentous substance, with much distortion.

From the Museum of John Howship, Esq.

1672. Section of the upper part of a humerus, in which nearly the whole of the medullary tissue is replaced by a pale, compact, dense, and apparently slightly vascular cancerous substance. Parts of the inner layers of the walls of the bone are hollowed-out and filled with the cancerous mass; but the shape of the bone is scarcely altered, and the texture of its remains, and all the tissues around it, as well as the articular cartilage, appear healthy. Just below the tubercles there is a transverse fracture of the shaft, which probably occurred shortly before death from a slight force.

In Sir Astley Cooper's Catalogue the specimens were marked "Scirrhus of the Os Humeri, producing fracture of it, from Mr. Stolworthy, Surgeon. The breast of the same patient is preserved" [probably in No. 4804].

From the Museum of Sir A. P. Cooper.

1673. The other section of the same humerus.

From the Museum of Sir A. P. Cooper.

1674. Part of the sternum with portions of some of the costal cartilages, from the same patient. Several small, round, flattened masses of cancerous substance are lying on and imbedded in the posterior part of the sternum and the adjacent tissues. *From the Museum of Sir A. P. Cooper.*

1675. A vertical section of part of a humerus, through the cancellous tissue of which cancerous matter, nearly resembling that in the preceding preparation, is diffused. The shaft was fractured twice about the junction of its upper and

middle thirds. New bone has been formed around the ends of the fragments, but no union has taken place. The walls of the upper portion are thin and irregular; those of the lower portion are nearly natural.

From the Museum of Robert Liston, Esq.

1676. The other section of the same humerus, partially macerated and dried. Its osseous tissue, especially in the upper portion of the shaft, has a peculiar chalk-like aspect; and in some parts the walls and the cancellous tissue have a nearly similar finely porous texture.

From a woman who had malignant disease of the breast and uterus and a malignant tumour in the neck.

From the Museum of Robert Liston, Esq.

Medullary Cancer.*

1677. "A portion of the skull of a Frenchman who died scrofulous."—*Hunterian MS. Catalogue.*

A vertical section of a frontal bone, with a tumour projecting on both its surfaces. The tumour, which is situated immediately over the falx, was nearly lens-shaped, and about three inches in diameter. It is composed of a soft, spongy and obscurely fibrous substance, and is slightly lobulated. The tissue of the bone, upon which it rests, is broken and destroyed, so that the boundaries of the section of the skull can hardly be discerned; but the tumour itself contains no bone. The dura mater is closely connected with the tumour; and on its cerebral surface are several small flat masses of a similar substance. In the other edge of the section of the skull, also, is part of another tumour of the same kind, which has formed within the bone and has nearly destroyed its tissue.

* Probably many of the specimens placed under this title might rather be called Sarcomata; but, in the impossibility of minute examination, it has been thought better to arrange them under the older name.

1678. Section of a rib from the same man, with a similar tumour formed within and around it.

1679. Section of another rib with a similar but larger tumour, from the same man. The substance of both the ribs is broken up like that of the skull.

1680. Portion of an ilium, probably from the same man, the interior of which is nearly filled with a substance similar to that composing the tumours already described. Its walls are somewhat expanded.

1681. Part of a sternum, of which the upper portion is enlarged by its interior being completely filled with a soft, brownish, spongy substance, around which the walls are expanded.

1682. Another part of the same sternum similarly diseased. Both these preparations were probably taken from the same patient as the tumours of the skull and ribs.

1683. A vertebra, probably from the same patient, of which a small portion of the anterior part of the body is ulcerated, and the interior is filled with a substance similar to that composing the tumour of the skull.

The seven preceding Specimens are Hunterian.

1684. A section of the bodies of several dorsal and lumbar vertebræ. The cut surface of the cancellous tissue has a flocculent appearance from infiltration with a cancerous growth, which in the recent state was of a pinkish tint and very soft.

From a married woman, aged 38, the mother of six children. About eighteen months before her death she noticed a lump in the right breast; but no operation was attempted, owing to her being pregnant. She lay long in hospital; and, from the constant pain in her back, the presence of some growth in the spinal column was suspected, though no tumour could be detected in the

back. She sank gradually. The growth in the breast was found to be a hard carcinoma; the spine was diseased from the cervical to the lumbar region: and there were secondary deposits in the pleura, liver, spleen, kidney, and one rib.

Presented by Dr. Goodhart, 1875.

1685. Section of a parietal bone, with a tumour projecting from its inner surface. The base of the tumour is connected with the whole thickness of the bone, the original tissue of which is nearly destroyed; but it seems to have originated in the diploe, with which it is more widely connected than with either table. It is of an oval flattened form, obscurely fibrous and granular, and projects only on the inner surface of the skull. The dura mater is closely adherent to it, and thickly set with ochre-yellow tubercles of substance similar to that of the tumour. The scalp and pericranium are healthy. *Hunterian.*

1686. The other section of the same parietal bone and tumour. *Hunterian.*

1687. Part of the parietal bone of a child, on each side of which is a lens-shaped tumour, nearly two inches in diameter, and half an inch in thickness, which has separated both the pericranium and the dura mater from the bone. The tumour is composed of a soft medullary substance; and small scattered masses of a similar substance appear to be deposited in the tissue of the bone itself.

Six months before death the child, at that time 10 months old, had one of its testicles removed for medullary disease, which had been two months in progress and protruded through the tunica albuginea. For four months after the operation the child appeared to be in good health; but at the end of that time a tumour formed beneath the scalp and increased quickly. The general health also declined rapidly, and the abdomen became very large. After death, medullary disease was found in the lumbar glands of the right side and in the left lung.

A further account of the case is published in 'The Lancet,' December 12, 1835, and in Mr. Langstaff's Catalogue, p. 372.

From the Museum of George Langstaff, Esq.

1688. A large tumour surrounding the upper two thirds of the femur, the hip-joint, and a large part of the dorsal surface of the ilium. It is twelve inches in length and seven and a half in transverse diameter. The surface of the section of the tumour shows some indistinct fibrous partitions crossing the otherwise nearly homogeneous mass. The external portion is tolerably firm and brain-like, whilst the centre is more soft, and in some parts broken down and shreddy. Spicules of bone are scattered irregularly through the substance of the tumour. In the middle is a cyst which, when recent, was filled with a transparent, viscid fluid.

From a man, aged 19, a servant. In August 1849 he felt a continued pain in the left hip and knee, followed in a few weeks by an enlargement below the trochanter, the tumour being at first round and hard. He continued to walk about until the early part of November, when the progress of the growth became more rapid. He was admitted into St. George's Hospital, December 5th, at which time the tumour extended from the middle of the thigh to the pelvis, surrounding the joint and projecting upwards on the dorsum of the ilium. A few days after his admission, while moving in his bed, the femur gave way in the middle of the tumour, the fracture being accompanied by a "cracking" sensation and considerable pain; the limb now gradually became bent, with eversion of the foot. The tumour progressively increased till its circumference was thirty-two inches, whilst that of the opposite thigh was only twelve inches. The pain was excessive; the skin became extremely tender, and the superficial veins greatly enlarged and distended.

About the middle of May a cough came on, and the expectorated mucus was once or twice tinged with blood. The patient, getting gradually weaker, died on the 2nd of June 1850.

On post-mortem examination each pleural cavity was found to contain about six ounces of serum tinged with blood; both lungs were congested and studded with numerous cancerous nodules (see Preps. Nos. 517 and 3418), rather more abundant in the right than the left lung. The heart was healthy; and there was no trace of disease in any of the abdominal or pelvic viscera, or in the absorbent glands of these parts. The tumour was attached to the whole of the external surface of the left os innominatum, from the upper part of the dorsum of the ilium to the rami of the pubes and ischium; and, completely surrounding the hip-joint, it extended to the lower part of the middle third of the femur. Its surface was irregular, somewhat nodulated, and invested by a layer of condensed areolar tissue, beneath which in its outer and posterior aspects several broad plates of bone, ranging from one to two inches in diameter, were felt. The femur, which passed

through the middle of the tumour, was extensively broken-up into small fragments and spicules of bone, many of which had been carried outwards by excentric growth of the tumour and distributed through its substance. The muscles of the thigh were pale, and expanded over the surface of the tumour. A few cancerous tubercles were deposited in the substance of the vastus externus, one being as large as a chestnut; others, of smaller size, were situated below the upper part of the sartorius and the origin of the rectus. The branches of the anterior crural nerve were expanded and flattened, the veins greatly enlarged; the superficial femoral artery and vein were curved over the inner surface of the tumour; and the profunda artery and vein entered its substance. The os innominatum was softened and flexible; a few small tubercles were developed on the inside of the ilium, near the anterior inferior spinous process; the obturator internus muscle was pushed upwards into the pelvis by the tumour; and the obturator nerve and vessels entered into its substance.

Presented by Cæsar H. Hawkins, Esq.

1689. Part of a femur, with a tumour developed within and around its shaft, about the junction of its upper and middle thirds. The tumour is about six inches in diameter, nearly globular; and its surface is irregularly knobbed. A deep incision into its inner side shows that it is composed of a soft, granular, and shreddy medullary substance, intersected by arched fibrous partitions and containing clots of blood. It is invested by thickened periosteum. The texture of that portion of the shaft which is involved in the tumour is completely broken-up and destroyed. It had been twice fractured; and the upper fragment is drawn inwards, and the lower upwards, so that their ends are wide apart.

The patient was a girl 19 years old. She had complained for two years of pain and swelling in the thigh, when, as she was walking across a street, the bone broke at the seat of the disease. It was broken a second time, as she was turning in bed; and after this the pain and swelling rapidly increased. Amputation was performed through the trochanter minor; and the patient recovered.

There is a sketch of this preparation in Mr. Liston's 'Elements of Surgery,' p. 187, ed. 1840.

From the Museum of Robert Liston, Esq.

1690. A section of the lower end and part of the shaft of a femur, with the adjacent tissues injected. The bone is surrounded by a tumour which appears to spring from the periosteum. The cut surface of the tumour is in parts white and uniform, in others vascular, and in its upper portion shows several irregular cavities. The epiphysis of the femur is free from disease; but immediately above it the tumour has invaded the interior of the bone, and the line of compact tissue in front and behind is here lost.

From a girl aged 19.

Presented by Henry Hancock, Esq., 1868.

1691. A tibia and fibula, with a large tumour around the upper part of the former. The tumour is of a flattened, oval form, and measures about eight inches in its greatest diameter. A section of one of its sides shows that it is composed of a soft, granular, and shreddy substance, arranged in large lobes, with thin fibrous partitions. Blood is effused in several situations near its surface. The upper third of the shaft of the tibia is completely involved in the tumour; below it, the bone is somewhat enlarged, and its surface is deeply channelled; above it, the head and articular surface are sound. The fibula is unaffected, though pushed outwards and flattened by the pressure of the tumour.

From the Museum of Robert Liston, Esq.

1692. The greater portion of a scapula, and of a large tumour, developed within and around it, which, together with part of the muscles and integuments covering them, were removed by operation.

From the Museum of Robert Liston, Esq.

The following account of the case is abstracted from Mr. Liston's 'Elements of Surgery,' vol. i. p. 213, ed. 1831, and p. 190, ed. 1840. The first portion of the history and a sketch of the preparation are published in the 'Edinburgh Medical and Surgical Journal,' vol. xvi. p. 66.

The patient was a lad sixteen years old, who, three months before he came under Mr. Liston's care, had first perceived, just

below the spino of the scapula, a small flat tumour, which pulsated distinctly. After that time it grew rapidly. When first examined it was "very large, hard, inelastic, firmly attached to the left scapula, and extending from its spine over all its lower surface. It also stretched into the axilla to within half an inch of the nervous and vascular plexus; and a large arterial trunk could be felt along its under surface." The arm was atrophied and powerless, and was the seat of excruciating lancinating pain. On attempting to move the tumour, independent of the scapula, crepitation was distinctly perceived, as if from fracture of osseous spicula. The scapula itself was movable, the chest was unaffected, and the vessels and nerves were not implicated in the swelling. "The operation was commenced," Mr. Liston says, "by making an incision from the axilla to the lower and posterior part of the tumour. The latissimus dorsi was then cut across, at about two inches from its insertion, so as to expose the inner edge of the tumour, with a view to tie the subscapular artery in the first instance; in this, however, I was foiled, owing to its depth. I then proceeded to dissect where I expected vessels to enter from the suprascapular; and in detaching the tumour from the spine of the scapula, I felt my fingers dip into the tumour. This was attended with a profuse gush of florid blood, with coagula: by a sponge thrust into the cavity, the hæmorrhage was in a great degree arrested; at the same time an attempt made to compress the subclavian failed, on account of the arm being much raised to facilitate the dissection in the axilla. The patient, exhausted, made some efforts to vomit, and dropped his head from the pillow, pale, cold, and almost lifeless. Then only I became aware of the nature of the case: nothing but a bold stroke of the knife could rescue the boy. Withdrawing the sponge, I by one rapid incision completely separated the upper edge of the tumour, so as to expose its cavity; and, directed by the warm gush of blood, immediately secured with my finger a large vessel at the upper corner, which, with open mouth, was pouring its contents into the sac. With my right hand I then removed the coagula, and, dissecting under my finger, separated the great subscapular artery, so that an aneurism needle was passed under it at its origin from the axillary, and about an inch from the sac. After securing this and two other large vessels, which supplied the cavity, I dissected off the tumour from the ribs, without further hæmorrhage, cutting the diseased scapula and the under part of the sac. I then found it necessary to saw off the ragged and spongy part of the scapula, leaving only about a fourth part of that bone, containing the glenoid cavity, processes, and half of its spine. The edges of the wound were brought together, and the patient lifted cautiously to bed. At this time he was pale, almost insensible, and without any pulsation perceptible through the integuments in the greater arteries, though the ends of the vessels in the wounds beat very forcibly. Stimuli were employed externally and internally: in the evening his pulse at the wrist was ninety and soft."

In less than a month after the operation the wound was nearly healed; and the patient returned home in seeming good health. But in the sixth week a dark purple tumour, formed of coagulated blood, about as large as a walnut, appeared at the upper part of the wound, about an inch from the point where the subscapular artery had been tied: repeated and profuse arterial hæmorrhages ensued from the opening at which this coagulum protruded; but they were checked for a time by dilating the opening and filling the cavity beneath it with lint pressed against the remains of the scapula. Soon after, spongy and bleeding granulations began to grow from the diseased bone, and, though often repressed, were constantly reproduced. The head of the humerus was also dislocated, apparently in consequence of disease of the glenoid cavity. Hectic ensued; the sore extended towards the axilla; and the patient, gradually exhausted, died five months after the operation.

"The sac of the tumour removed by the operation was composed of bony matter arranged in strata of short fibres pointing to the cavity. Its outer surface was smooth, and covered by a dense membrane; the inner was studded with projecting spicula. The lower part of the scapula, partially absorbed, lay in the middle of the sac, covered by the remains of its muscles and by coagula. Very large vessels were perceived ramifying on the surface of the tumour."

The preparation exhibits, in front and at its circumference, a section of the walls of the osseous and fibrous sac, which are most distinct at its upper part. It is partially filled with a soft granulated substance, like a mixture of coagulated blood and brain-like matter. A portion of the diseased scapula is affixed at the lower part of the sac to the right. Other portions are suspended in the lower part of the bottle. The posterior part of the larger mass exhibits the portion of the integument and the subjacent tissues which were removed with the tumour.

1693. The remains of the scapula, removed after death from the subject of the preceding case, macerated and dried.

Mr. Liston says, in his work already referred to, p. 192:—"Portions of the acromion process, superior costa, and spine of the scapula were of their natural appearance. But the coracoid process, the glenoid cavity, and the cervix were entirely destroyed, and their situation occupied by an irregular broken-down tumour, consisting of osseous spicula and cancelli, irregularly disposed, and forming cavities filled with blood, partly fluid and partly coagulated. The head of the humerus was extensively absorbed. The articular cartilage was almost entirely destroyed, particularly on the inner side, where a large portion of the bony matter had also been removed. The ulcerated surfaces were of a dark bloody colour."

From the Museum of Robert Liston, Esq.

1694. A vertical section of a knee, with a tumour of the tibia. The anterior part of the head of the tibia is involved in the base of a large, lobulated, soft, spongy, and in some parts shreddy, tumour, with many small cysts, by the growth of which all its tissue seems destroyed. From this position the tumour has extended forwards, stretching the ligamentum patellæ and the adjacent parts, and upwards into the cavity of the joint, which it almost completely fills. Its surface within the joint is covered by synovial membrane ; but its pressure has caused absorption of part of the cartilages of the femur and patella. A morbid substance, similar to that of which the tumour is composed, appears thinly deposited in the cancellous tissue of the adjacent part of the tibia ; but the femur, the patella, and the rest of the tibia are healthy. *Hunterian.*

1695. Section of a knee-joint. The lower end of the femur is filled and surrounded with a very soft, shreddy, and granular medullary tumour, by which a great part of the osseous structure has been destroyed and removed ; a small portion only of the articular end remains, covered with its cartilage. The end of the shaft of the femur, softened, ulcerated, and full of medullary matter, projects loosely into the substance which occupies the place of the destroyed bone, and is surrounded for some inches up the thigh by a continuation of the morbid growth, which, however, at this part has a more uniform and firmer texture than it has about the chief and primary seat of the disease. The part of the cavity of the knee-joint corresponding with the remaining portion of the articular end of the femur is healthy. *Hunterian.*

1696. A finger, amputated at the carpal joint. The first phalanx is destroyed by the growth of a soft, pale, yellowish white brain-like tumour within it.

From the Museum of Robert Liston, Esq.

Softening of Tumours.

1697. A humerus, the middle of the shaft of which is surrounded by a lobulated tumour, about four inches in its greatest diameter, and of an irregularly rounded form. The tumour is invested with a capsule about a line thick ; and its interior is composed, chiefly, of small but irregular cysts with thick walls, some of which contain a semitransparent substance. It was found on microscopical examination to be a cartilaginous tumour softened by mucoid degeneration.

The patient was a man forty years old. The tumour was ascribed to a blow on the arm received three years previously. Its growth was accompanied with severe pain. Amputation at the shoulder-joint was performed ; and the patient recovered.

From the Museum of Robert Liston, Esq.

Entozoa in Bones.

1698. Sections of part of the ilium of a ruminant. The internal structure of the bone is destroyed and its walls are expanded by the development of numerous hydatids within it. A portion only of these remain ; they are not of large size ; and most of them are burst and rolled-up. The membranes of some of them are thickened. The exterior of the bone at the part chiefly swollen, as well as elsewhere, is smooth and evenly rounded ; its interior is rough, with projecting points and ridges.

Presented by the Trustees of the British Museum.

1699. "A cyst, which was filled with water, formed in and filling up the bone of an Ox."—*Hunterian MS. Catalogue.*

A vertical section of the humerus of an Ox, the whole medullary tube of which is exactly filled by a cyst with thin, white, glistening, and semi-transparent walls, like those of an acephalocyst hydatid. The cyst is distended with cotton in the form which it had before the fluid was let out from

it; it is divided into two portions at the lower end, where the medullary tube also divides to be continued into the condyles of the humerus. The walls of the bone are sound; and their interior is in contact with the cyst, but not connected to it by any kind of tissue.

The cyst is probably that of a hydatid, which, growing in the direction of the least resistance, has caused the removal of all the medullary tissue, of which it now occupies the place.

Hunterian.

1700. The other section of the same humerus, macerated and dried. The interior of the cavity which contained the hydatid is nearly smooth, but presents several slightly elevated ridges, which at the lower part form imperfect partitions. *Hunterian.*

Bones altered by the growth of Tumours.

1701. The right half of the lower jaw of a Sheep, the anterior part of which is dilated into a cyst of a regularly oval form, measuring three and a half inches in longitudinal, and two inches in transverse, diameter. Its walls are not more than one eighth of a line in thickness, and are smooth on the greater part of both their surfaces. There is an aperture at the anterior part of the cyst, which appears to have been formed by ulceration, and around which the surface is rough and irregular. The separate part of the outer wall was broken-off to exhibit the interior of the cyst. The cyst was probably, in its origin, connected with the teeth.

Hunterian.

1701 A. The upper portion of the left rib of some large animal (Horse?) having two oval hollow enlargements, with thick irregular bony walls and smooth interior, partially divided by septa. *Presented by G. W. Mackmurdo, Esq.*, 1867.

1702. A thin irregularly nodulated plate of bone, which was connected with a right parietal bone, and formed the basis of a very large tumour removed from the side of the head.

"Hannah Jones came into St. George's Hospital in 1816, with a tumour, the basis of which was bone; but the most prominent part was of a softer substance. It had its origin underneath the external table of the right parietal bone; and the tumour in its progress forward approached so near the outer edge of the orbit, that there was only space to admit the blade of the saw between them." The tumour was attached all over the right frontal, temporal, and part of the parietal region of the skull, as low as the right eyebrow; and it hung down, in the shape of a great round flask, on the right shoulder, extending outwards further than the shoulder, and fitting in and overlapping the side of the face and neck. It had its origin in the kick of a horse, when the patient was between two and three years old; and had gradually increased.

The patient was twenty-five years old when she came under the care of Sir Everard Home, by whom the operation was performed, on the 9th of October, 1816. "The operation was begun by a crucial incision through the integuments down to the surface of the tumour; the four flaps of skin were turned back; and all the soft parts of the tumour, which consisted of fat mixed with steatomatous substance, were removed; and as doing this had occupied a considerable time, the skin was brought over the remaining tumour, and the patient put to bed. The pain had not been severe, and was submitted to with great fortitude. On the next day the skin was turned back, the bony rim surrounding the base of the remaining tumour formed by the external table was exposed all round; and as it was close to the orbit, a saw was so contrived that its blade could be passed between them, having an iron bow fixed upon the opposite side of the blade instead of behind; so that there was no impediment to the working of the saw till the extensive base of the tumour, that consisted wholly of bone, was sawed through. The integuments were then brought forwards; and although they were at first so much too large as to be thrown into folds, they very soon contracted, and in a few days did not extend beyond the surface on which they were laid; and the parts healed in the same manner as any other wound, leaving a firm cicatrix, with a more regular surface than there was reason to expect. In the course of the healing of the parts, no symptoms, either local or constitutional, were produced"*.

The patient was in good health in 1847.

Presented by Sir Everard Home.

* Extracted from "A short Tract on the Formation of Tumours;" by Sir Everard Home, Bart. London, 1830, 8vo, p. 12. Sketches of the patient, before and after the operation, are given in this Tract; and there is a cast of her head in the Museum.

1703. The upper part of a skull which, by the progress of malignant growths on the dura mater and in its substance, has been perforated in several situations, and has numerous deep circular ulcerated cavities, with sharp broken margins, in its internal table and diploe. The diseased structures were developed chiefly along the course of the longitudinal sinus, near which, besides presenting several deep excavations from within, and a perforation an inch wide at the angle of the occipital bone, the substance of the skull is riddled with numerous small round apertures, of which some open internally, some externally, and others pass completely through. Around the margins of the large apertures and cavities small quantities of new bone are deposited on the inner table; but, with this exception, the parts of the skull which intervene between the ulcers are quite healthy.

"From the Hon. George Grenville.—On opening the body, many other bones were found in the same condition, where, in place of the bone that was removed, there was found a curdly substance." —*Hunterian MS. Catalogue.* Spontaneous fracture of some of the bones occurred during life.

1704. Portion of a rib from the same gentleman, in the interior of which is a cavity that opens widely on both its sides. Its broken end exhibits part of a similar cavity; and its walls are perforated by numerous small apertures.

Hunterian.

1705. The lower end of the left humerus of the same gentleman. The substance of the shaft, through a length of nearly three inches, was nearly all destroyed by a malignant growth in the medullary tube. The remaining portion of the wall has a small quantity of new bone deposited upon its outer surface. It broke, under a very slight force, a short time before death. *Hunterian.*

1706. The upper half of the right femur of the same gentleman. A large portion of its shaft was destroyed by the growth

of a tumour in the medullary tube ; and the remains of the wall, covered with new bone, and neither expanded nor much thinned, broke under a slight force. *Hunterian.*

1706 A. "Part of the os frontis of a man who died at St. George's Hospital. He had several hard risings on his head, which appeared to be bony, and were by the physician and surgeons supposed to be venereal ; but, from the history of the case itself, there was no reason for supposing it venereal. The man died of consumption ; and upon examining those swellings they appeared to be a scrofulous increase of the periosteum only."—*Hunterian MS. Catalogue.*

For the sense in which Mr. Hunter used the term "scrofulous" in speaking of this, as well as some other morbid growths, see No. 3209.

1707. A skull, in the walls of which are numerous holes of various size and shape, with abrupt sharply jagged edges, which appear to have been consequent on the growth of malignant tumours on the dura mater, or in the interior of the bone. The chief disease is on the left side, in which, in addition to several smaller perforations of the skull, the greater part of the temporal fossa, together with the basilar portion of the occipital bone, the left side of the body, and the left alæ, and pterygoid processes of the sphenoid bone, have been destroyed. All the apertures are larger on the inner than on the outer surface of the skull ; and, besides them, there are several cavities on the interior which have not yet proceeded to perforation. Some of these cavities reach only to the diploe ; while over others, which are somewhat deeper, the outer table is perforated by a few very minute apertures, the indications of the commencement of the process by which its more complete destruction would have been effected. At one situation alone, near the upper part of the occipital bone, there is an ulcerated cavity opening externally, without any disease of the internal table. Around many of the apertures, both on the external and, to a greater extent, on the internal surface of the skull, thin layers of new bone have been formed. *Hunterian.*

1708. The upper part of a skull, in which there is in the frontal bone a circular perforation two and a half inches in diameter, with abrupt jagged edges. The pericranium over the aperture is not completely destroyed; and in the part which is preserved there are several small lamellæ of bone, the remains of the external table; but they are connected to the margins of the aperture by the pericranium alone. On the interior of the rest of the skull there are several deep ulcerated cavities, with sharp abrupt margins, which are for the most part circular in form and from two to six lines in diameter. They extend through the inner table and diploe; the external table over them is very thin, and in a few situations is perforated by small apertures. The portions of the skull intervening between the ulcers are healthy. The disease was probably, like the preceding, consequent on the growth of malignant tumours of the dura mater.

Hunterian.

1709. Portion of a skull, in which there are several perforations and cavities exactly like those just described. They were produced by the growth of medullary tumours of the bone and dura mater.

From the same patient as the tumours of the bones described as Nos. 1677 to 1683.

Hunterian.

1710. Portion of a skull, removed with a trepan. There is a perforation in it, such as may have been produced by a tumour growing from within outwards. *Hunterian.*

1711. The upper part of a skull, in which an irregular ulceration has destroyed the greater part of the roof of each orbit, all but a small portion of the right side of the frontal bone, the anterior parts of both parietal bones, the outer surface of the left ala of the sphenoid bone, and the anterior part of the squamous portion of the left temporal bone. The margins of the ulcer are irregular, but in many places abrupt. In

part of its extent the ulcer has destroyed the whole thickness of the skull, exposing the dura mater, upon which there are numerous isolated small spots of cancellous bone, and which is perforated in a few small places; but the greater part of the base of the ulcer is formed by an uneven layer of bone, the remains of the ulcerated skull thickened and condensed. The interior of the skull adjacent to the ulceration is healthy; and the diploe is not more widely destroyed than the compact layers.

The patient was a man 32 years old. The integuments over the disease of the skull were involved in a large malignant-looking ulcer, surrounded by dark, livid, and tense skin. Beneath the ulcer was a greyish soft substance, in which the fragments of bone fixed on the dura mater were imbedded. The disease had existed five years and had commenced in a small hard tumour in the scalp. There were present, also, signs of affection of the cervical part of the spine, consisting in a considerable projection of its lower vertebræ, partial loss of sensation and voluntary motion, severe pain about the shoulders, and inability to raise the head. The left eye was at last completely destroyed, and pushed from the orbit; and the ulceration extended to the left zygoma and to parts of the ethmoid bone.

Nine years before death the patient had syphilis, and took a large quantity of mercury; but the healthiness of what remains of the internal surface of the skull, and of the diploe at the borders of the ulcer, and the regular progress of the ulceration over the outer surface of the bones, and thence through their substance, as well as the general aspect of the remaining bone, make it probable that the destruction in this case was consequent on the bone becoming involved in some cancerous disease of the integuments.

From the Museum of Robert Liston, Esq.

1712. A skull, with the osseous part of a large tumour connected with the bones of the right side of the face. The tumour had its origin in the antrum, was five years in progress, and in its growth destroyed all the right orbit except its roof, and involved or destroyed the whole of the right malar, palate, and superior maxillary bones. The part which has remained after maceration consists of an oval mass of light cancellous bone, about five inches in its chief diameter, and very slightly connected with the remaining bones of the face. At its lowest part it preserves somewhat of the form

of the alveolar border of the upper jaw, and the incisor, canine, and bicuspid teeth are implanted in it. A circular portion of the frontal bone, just above the right temple, is thin, and perforated by several small apertures, apparently in consequence of the growth of a tumour from the dura mater. *From the Museum of John Heaviside, Esq.*

1713. A lower jaw, the right half of which is distorted and in great part destroyed, apparently by the growth of a tumour in its interior.

1714. An inferior maxillary bone, of which the greater part of the right horizontal ramus (including all its alveolar border) has been destroyed, probably by the growth of a tumour. There is some ulceration also of the inner surface of the ascending ramus; and around all the ulcerated parts, as well as on parts of the left side of the bone, a thin layer of new bone has been formed. *Hunterian.*

1715. A scapula in which the glenoid cavity, acromion, and coracoid process have been destroyed by the growth of a large tumour. *Hunterian.*

1716. The femur of a young girl, around which it is probable that a large malignant tumour grew. The whole of the bone is exceedingly light and porous. The surface of the lower four fifths of the shaft is ulcerated, and rendered uneven by irregular formations of very light spongy bone. In the lower third there remains, in the place of the shaft, only a shapeless portion of light porous bone, with traces of a central (medullary?) cavity. The inferior epiphysis is separated, a great part of its osseous tissue is removed, and its articular surface is ulcerated.

Presented by Robert Keate, Esq.

1717. A femur, with the acetabulum and adjacent parts of the pelvis broken into several pieces. At and around the seats

of the fractures there are large reticular spaces, the cancellous tissue and parts of the wall being almost wholly destroyed by the growth of cancerous tumours within them. A fracture, about four inches below the top of the great trochanter, has been united at an angle of 100° by irregular osseous bands, separated by wide intervals. At the other fractures, which have taken place at the base of the neck of the femur, through the great trochanter and through the bodies of the ischium and os pubis, there is not any indication of an attempt at union. Two small portions of the body of the ischium are completely separated; the lower part of the acetabulum is destroyed; and its upper border consists of a widely cancellous tissue in which the morbid substance was deposited.

From a woman whose breast had been removed for medullary cancer in the mammary gland.

From the Museum of Robert Liston, Esq.

1718. The lower part of a femur, the end of which is expanded into a large and irregular osseous cyst. The cyst is incomplete at its posterior part; its walls vary from half a line to a quarter of an inch in thickness; their exterior is smooth, but their interior is rendered very irregular by ridges forming imperfect partitions across its cavity. The articular surfaces of the condyles are ulcerated. The shaft of the femur ends abruptly at the upper part of the cyst. It is probable the cyst was filled with a malignant or a myeloid sarcoma which had originated in the cancellous tissue of the lower end of the femur. *Hunterian.*

1719. The upper part of a tibia similarly diseased. The head is expanded into a spheroidal cyst about six inches in diameter and four inches in depth. The osseous walls of this cyst are thin and incomplete, presenting several large apertures, and formed in part by an irregular network of osseous bands. The apertures were, probably, closed-in with periosteum. The articular surfaces are ulcerated and rough. The shaft of the tibia terminates abruptly at the cyst, near

which a small quantity of new bone has been formed on its surfaces. *Hunterian.*

1720. A similar specimen.

This and the preceding may illustrate what has been called Spina Ventosa.

1721. The upper part of a tibia, in the head of which there is a large cavity around which the walls have grown into a thin, osseous, and membranous cyst. The cyst is laid open behind. It may have contained either pus or a medullary or myeloid tumour. *Hunterian.*

1722. Part of a tibia, of which the lower end is almost entirely destroyed. From what remains of its walls it seems to have been first expanded; and its destruction was probably consequent on the growth of a malignant tumour within it. *Hunterian.*

1723. A tibia and fibula. Two inches of the middle third of the fibula have been completely destroyed; and of two inches more nothing remains but a thin shell, which is fixed by new bone to the adjacent part of the tibia. The rest of the shaft of the fibula is thinly covered with new bone. Similar deposits have taken place on many parts of the shaft of the tibia; but at the part which is opposite to the destruction of the fibula its wall is superficially ulcerated. The changes are said to have been caused by the extravasation of blood in this part: they have the aspect of those caused by malignant growths; perhaps a medullary tumour existed in which a large extravasation of blood had occurred. *Hunterian.*

1724. The lower halves of the tibia and fibula of a young person. A great portion of the lower end of the tibia, including its epiphysis, has been removed, and other large portions are separated by ulceration; but the articular cartilage is entire. The fibula is superficially ulcerated at the part adjacent to the tibia. It is most probable that these changes were produced by the growth of a large malignant tumour, and that its primary seat was in the substance of the wall of the

tibia; for, at the upper part of the chiefly diseased portion, some of the inner layers of the wall remain, preserving the shape of the shaft of the tibia, while the outer layers have been separated from them and carried outwards, as if by the pressure of a growth beneath them. Below this part the outer layers of the wall are lost; but the remaining fragments of the inner layers still represent the proper form of the lower end of the shaft. The remains of the cancellous tissue of the epiphysis and lower part of the shaft are filled with some morbid substance. *Hunterian.*

1725. Part of a tibia, in the upper third of which there is a cavity opening in front, and probably into the knee-joint. The walls of the shaft are irregularly expanded and enlarged around the cavity, and the articular surfaces are ulcerated. The cavity may have been that of an abscess. *Hunterian.*

Various or uncertain Formations of Bones.

1726. A portion of a parietal bone, to the inner surface of which a small, circular, flat tumour is attached. The adjacent bone is healthy. *Hunterian.*

1727. Two portions of a skull removed with a trephine. Both of them are ulcerated; and in one the ulcerated spaces are filled with a fleshy substance. *Hunterian.*

1727 A. Section of the lower part of a femur, on the posterior and inner margin of which a small tumour is seated about three inches from the lower edge of the internal condyle. It has an elongated form; its surface is nodulated, fissured, and wart-like; its texture is soft and, when recent, resembled tallow congealed after having been melted. On one side of the shaft a soft growth lies beneath the periosteum partially imbedded in the bone. The whole of the femur is rather enlarged; its periosteum is thickened; and there is a large empty cavity in its cancellous texture.

The patient was a man 40 years old, who had had necrosis of

this part of the femur two or three years previously. The ulcers in the ham connected with the diseased bone had healed after exfoliation; but they reopened, the tumour shown in the preparation protruded through the integuments, and such profuse hæmorrhages took place from it that the removal of the limb became necessary. The patient recovered after the amputation.

From the Museum of Robert Liston, Esq.

1727 B. Portions of bone separated by exfoliation from the femur last described.

1728. Section of a finger, on which a small tumour of soft fibrous substance has been formed around the distal end of the first phalanx. The tumour is intimately connected with the periosteum, and imbedded in a part of the surface of the bone. The flexor and extensor tendons are stretched over its surface. *Hunterian.*

1729. Part of the first phalanx of a great toe, nearly surrounded with a mass of gouty deposit. *Hunterian.*

1730. The head of a Red Deer with the right antler considerably less developed than the left.

Presented with the two following specimens by Dr. Richard Quain, 1868.

1731. The bones of the left tarsus of the same Deer, with part of the tibia and metatarsus. The ankle-joint has been injured at some former time, apparently by the passage of a ball through the lower end of the tibia; and a large quantity of spongy new bone has been formed around it.

It is supposed that the injury to the leg was the cause of the defective growth of the antler.

1732. The left antler of a Red Deer (*Cervus elaphus*); it is imperfectly developed, probably in consequence of an injury to the right elbow-joint.

The other chief specimens of Diseases of Bones are in Series I., II., III., & VI.

Series XIII. INJURIES AND DISEASES OF JOINTS.

Consequences of Wounds: 1820, 1832, 1976.
Dislocations by External Violence: 1733 to 1774.
Artificial Distortions: 1775 to 1785.
"False Joints": 1739 to 1743, 1763 to 1767.
Diseases (chiefly) of Synovial Membrane: 1786 to 1802 A; and see some "Ununited Fractures" in the last Series.
Diseases (chiefly ulcerative) of Articular Cartilages and the Articular surfaces of Bones: 1771, 1803 to 1856, 1955, 1959, 1970 to 1973, 1982–3; and many specimens of Excision, 1997 e. s.
Suppurative diseases of the Hip-Joint: 1857 to 1897; 1968–9, 1992.
Diseases of Articular Ligaments: 1857 to 1863, 1900, 1993 to 1995.
Fibrous Degeneration of Articular Cartilage and other changes in "Osteo-Arthritis": 1898 to 1920, 1924 to 1926, 2037 to 2039 e. s.
Compare changes after dislocation: 1740–1, and the healed surfaces of ulcerated articular parts of bones, as in 1884, 1886.
Articular Disease in Ataxia: 1921, 1922, 1922 A?
Morbid Growths and pendulous and loose bodies in Joints: 1738 to 1740, 1902 to 1904, 1923 to 1936.
Gouty formations in Joints: 1937 to 1948.
Fibrous Ankylosis: 1789 to 1793, 1802, 1866, 1867.
Osseous Ankylosis: 1771, 1835, 1890 to 1892 A, 1949 to 1988, 2040 to 2060.
Dislocation consequent on Disease: 1862, 1872 to 1874 A, 1881, 1887, 1893, 1989 to 1996, 2008.
Excised parts of Joints: 1873–4, 1997 to 2018.

Dislocations by External Violence.

The specimens of these Dislocations are arranged according to the seats of injury. The dislocations from disease are placed at the end of the illustrations of those Diseases of the Joints in which they have their origin. Of the other injuries to which joints are liable, Wounds of Joints are not placed separately, because their chief interest lies in the diseases of the articular structures which commonly follow them; and Fractures in Joints, not combined with dislocations, are placed with the other specimens of Fractures.

Spine. (See next Series.)
Sternum: 1733.
Clavicle: 1734.

Humerus: 1735 to 1753.
With fracture: 1740, 1751 to 1753, 1759.
Radius, Ulna, or both: 1754 to 1759.
Bones of the Hand: 1760–1.
Femur: 1762 to 1766.
Tibia: 1767.
Bones of the Foot: 1768 to 1774.
With fracture: 1771–2.
Dislocations consequent upon Disease: 1989 to 1996, 2008.

1733. A vertical section of the upper half of a sternum, exhibiting a dislocation between its first and second portions. The lower portion has passed more than half an inch upwards behind the upper one; and they are united by osseous substance in the angles, above and below the separated surfaces.

The patient was a man 60 years old, in whom the injury was produced by a fall from a tree. He sustained some injury of the head and was delirious for several days. He continued many weeks in a very precarious state, and had purulent expectoration, but gradually recovered, so far as to be able to walk out. He died, however, five months after the accident with stricture and ulceration of the œsophagus. The lungs were found to have extensive adhesions, and appeared to contain some pus. The heart was healthy; but a portion of the pericardium, and of the adjacent part of the lung, were adherent to the injured part of the sternum.

The other portion of the sternum is in the Museum of St. Bartholomew's Hospital.

Presented by Joseph Swan, Esq.

Dislocations in the Upper Extremity.

1734. The clavicle and scapula of a young person. The clavicle was dislocated from its articulation with the acromion, with which it is now connected by a band of ligament nearly an inch long. A portion of bone, which appears to have been broken from the acromion, is imbedded in this band.

Hunterian.

1735. A section of a healthy shoulder-joint, for comparison with the effects of injury and disease. The section is made in a

horizontal plane below the spine of the scapula, and through the middle of the glenoid cavity and of the head of the humerus. *Hunterian.*

1736. The other section of the same joint. *Hunterian.*

1737. The scapula and the ligaments attached to it, from a shoulder-joint, three weeks after the reduction of a dislocation.

The following account of the dissection of this preparation was left by Mr. Hunter:—

Dislocation of the Shoulder with its Examination after Death.

A man came into St. George's Hospital with a dislocation of the shoulder, which was reduced. About three weeks after he was taken with a fever, and died. I was anxious to examine the state of the parts in so recent a dislocation. As the head of the os humeri had passed into the arm-pit, I paid particular attention to this side of the joint. I first removed the deltoid and pectoralis muscles, with the latissimus dorsi &c., leaving only those muscles that arose from the scapula.

On viewing those parts, I saw plainly that the subscapularis was much injured at its upper edge, just under the coracoid process, being there mixed with extravasated blood, so as to destroy all regularity of muscular fibres. I now endeavoured to dislocate the os humeri inwards, under the subscapularis muscle, but could not, although I could make the head of the bone rest on the edge of the glenoid cavity.

On dissecting off the infra- and supra-spinatus muscles, I found nothing uncommon respecting the capsular ligament; but when I dissected off the subscapularis, I found the ligament in some degree injured, so as to have lost a good deal of its uniformity in structure. It was of a darkish blue colour; a consequence of extravasation in part absorbed.

I cut the capsule &c. round, near to the os humeri, where it was sound, so as to expose the inner surface of the ligament, and found that on the inner surface, between the insertion of the tendon of the subscapularis muscle into it and its fixture to the edge of the glenoid cavity, (it) was injured, corresponding with the external surface, although I could not say fairly ruptured through.

I also found that a circular part of the cartilage on the edge of the glenoid cavity, to which the ligament is fixed, was torn away from the bone, for about an inch of the circle, and which must have been pulled off when the head of the humerus pressed against

the ligament: and this is a proof that the head of the humerus must have pressed against the ligament with great force, but it kept its attachment at the two ends to the remainder. The separation was such as could not allow any thing to pass between the bone and it.

There was little or no extravasated blood in the cavity of the joint: but what was very remarkable, and what I did not expect, I found a good deal of pus in the joint. If this is common in such cases, what becomes of it?

We may observe that the ligament of this joint is differently circumstanced from most others: where it is attached to the os humeri, it is strengthened or bound by the tendons of three muscles, and, of course, the weakest part of the ligament is where it is fixed to the scapula.

Here was a case of undoubted dislocation, and yet the capsular ligament not torn where the dislocation was; although it must be supposed that the giving way of the cartilage at the edge of the glenoid cavity admitted the ligament to yield more than it otherwise would.

Although the ligament was not torn so as to let the head of the bone escape through the rent part, yet the head of the bone was certainly out of the socket; and from all the appearances and circumstances taken together, how it got there without doing more mischief I do not understand.—*Hunterian MS.*, "*Cases and Dissections*," No. 76.

1738. A shoulder-joint, in which the head of the humerus appears to have been recently dislocated forwards and downwards. There is a rent, an inch long, in the anterior part of the capsule, near the glenoid cavity (the larger opening in the upper part of the capsule was artificially made). The subscapular muscle and other tissues for some distance beneath the coracoid process appear to have been crushed. On the interior of the capsule are many pedunculated growths; and new bone has been formed in nodules around the border of the head of the humerus; but these probably existed before the dislocation. The tendon of the biceps is entire.

Hunterian.

1739. A shoulder, in which the humerus was dislocated forwards and downwards long before death, and was not reduced. The glenoid cavity is diminished in size and depth; its articular cartilage is wholly removed; and the exposed bone, which before dissection was covered with a smooth mem-

brane, is rough. The anterior border of the glenoid cavity is destroyed, and replaced by a shallow concave surface which forms part of the cavity in which the humerus rested; on its posterior border the glenoid ligament remains; but there is a deep and broad depression at its lower part, over which the tendon of the infraspinatus muscle passes. The head of the humerus is placed on the anterior part of the scapula, with its upper border half an inch below the coracoid process; it rests on a shallow concave surface, formed partly by the anterior border of the glenoid cavity, and partly by a mass of tough and elastic fibrous tissue adherent to the front of the scapula; its surface is irregular and flattened; and its articular cartilage, where any remains, is very thin. The shaft of the humerus is directed straight downwards, and appears to have been pretty freely movable. The coracoid process was fractured half an inch from its extremity; its portions are united by ligament, and are movable upon one another. The capsular ligament appears to have been extensively torn at its posterior part, where a portion with a ragged margin, and beset with fibrous pedunculated growths, remains attached to the neck of the humerus; all the rest, except a small piece at the upper part of the joint and another portion at the lower part, has been removed. The upper half of the subscapular muscle has been removed; but the anterior part of the head of the humerus presents a broad and deep groove, over which the fibres of the muscle passed to their usual insertion. The tendons of the supraspinatus and infraspinatus muscles retain their connexions with the humerus; but that of the former is drawn forwards, and much stretched where it passes over the upper and anterior part of the glenoid cavity, and that of the latter is lodged in a deep groove on the posterior border of the same cavity. The teres major and the lower part of the subscapular muscles are much relaxed. *From the Museum of Robert Liston, Esq.*

1740. A shoulder-joint in which the head of the humerus was dislocated downwards and forwards, and not reduced. The head of the humerus rests below, and in front of, the glenoid

cavity, in a hollow bounded by a deposit of bone, on the anterior margin of the glenoid cavity and on the belly of the scapula. The surface of this fossa is in part bony, hard, and smooth, and in part covered with smooth ligamentous tissue; the posterior portion of the head of the humerus, which rested and moved in it, is flattened, and its articular cartilage appears of natural thickness. Some of the articular cartilage is removed from the anterior part of the head of the humerus, exposing a hard smooth surface of the subjacent bone. The upper and posterior part of the capsular ligament is torn; the margins of the rent, indicated by bristles, are thickened and beset with a fringe of fibrous pedunculated growths. Another portion of the capsular ligament is turned-in between the glenoid cavity and the tuberosities of the humerus. The greater tuberosity appears to have been broken-off and reunited; for it is very prominent, obliquely placed, and not smoothly continuous with the upper part of the shaft. The tendon of the biceps muscle is entire. *Hunterian.*

1741. A scapula and humerus. The head of the humerus was dislocated downwards, forwards, and inwards many years before death, and was not reduced. It became flattened and enlarged, and its articular surface rested on a deep concave surface of new bone formed on the front and inferior costa of the scapula, immediately below and on the inner side of the glenoid cavity. A large irregular prominence of new bone is directed backwards and upwards from the great tuberosity of the humerus: it is probable that the elongated supraspinatus and infraspinatus muscles were attached to it. The glenoid cavity has lost its original form; its outline and surface are irregular; and all its articular cartilage is removed. The humerus appears to have moved freely in its new articulation.

From the Museum of John Howship, Esq.

1742. Section of a shoulder-joint, cut in a horizontal plane through the middle of the glenoid cavity, long after the incomplete

reduction of a dislocation, in which the head of the humerus appears to have been carried forwards. The articular surfaces are only partially adapted ; the anterior two thirds of that of the humerus are not applied against the glenoid cavity, and are separated by a deep depression from the posterior third, which is so applied. The articular cartilages appear healthy ; the capsule is shortened and very much thickened ; the long tendon of the biceps muscle is reduced in size. *Hunterian.*

1743. The other section of the same joint. *Hunterian.*

1744. The bones of a shoulder-joint. The head of the humerus is dislocated forwards ; and the posterior half of its articular surface rests on the elevated concave surface of a mass of new bone accumulated on the anterior surface of the scapula, directly in front of the glenoid cavity and below the base of the coracoid process : the opposed surfaces are smooth and accurately adapted. The forms of the head of the humerus and of the glenoid cavity are but little altered ; but new bone is formed in isolated spots on the original articular surfaces of both. New bone is also abundantly formed on all the surfaces of bone adjacent to the joint ; and a large mass projects from the posterior and lower part of the great tuberosity of the humerus, which appears to have afforded attachment to the elongated tendons of the supraspinatus and infraspinatus muscles, though some portion of it may have been formed in consequence of injury of the tuberosity.

From the Museum of Robert Liston, Esq.

1745. A left scapula and part of the humerus, showing an old unreduced subcoracoid dislocation. The two bones have been slightly separated to show the changes in their articular surfaces ; but in other respects their relative position, as discovered on dissection, has been retained. The humerus is dislocated forwards and inwards. The inner aspect of its head rested immediately under the coracoid process in a cavity formed by an elevated formation of new bone,

attached externally to the neck of the scapula close to the glenoid cavity, from which it is entirely distinct. The border of the glenoid cavity has made a deep groove in the back part of the anatomical neck of the humerus ; and this bone is rotated outwards, with stretching of the infraspinatus and teres minor muscles, which were not lacerated. The groove for the biceps tendon is prolonged upwards and backwards ; and there are deposits of new bone on the tuberosities and on the posterior edge of the glenoid cavity. The head of the humerus is smooth and normal, except that it is slightly encroached upon by the deep groove in the anatomical neck behind. The surface of the glenoid fossa is almost normal ; but the surface of the new cavity is slightly irregular and very porous.

From a woman aged 84. There was free passive movement of the joint in all directions.

Presented by Alban Doran, Esq., 1874.

1746. A scapula and humerus. The head of the humerus was dislocated forwards and inwards many years before death. Its posterior part rested on a concave surface, formed partly by the anterior edge of the glenoid cavity, and partly by some new bone deposited on the front of the scapula just below the coracoid process. That portion of the head which was next the anterior margin of the glenoid cavity is grooved and flattened in adaptation to that margin and the adjacent new articular surface. The anterior part of the glenoid cavity is worn down by the pressure of the humerus ; its edge fits in the groove on the humerus just described ; its posterior part retains its articular surface, and was in relation with a flat surface behind the groove at the base and posterior part of the head of the humerus.

The limb was capable of free motion, and was nearly as useful as the other.

From the Museum of Robert Liston, Esq.

1747. The bones of a shoulder-joint. The head of the humerus was dislocated forwards ; and its posterior half rests on a shallow concave surface of new bone formed on the scapula,

in front and on the inner side of the glenoid cavity, just below the coracoid process. The anterior half of the original articular surface of the humerus has thin formations of new bone on it ; and a large projecting mass of new bone has been formed just below the great tuberosity, apparently for the attachment of the supraspinatus and infraspinatus muscles. The glenoid cavity is reduced in size ; its anterior margin is a little worn down, and its surface is rough. *Hunterian.*

1748. A right shoulder-joint, dissected to show an old unreduced subcoracoid dislocation of the humerus. The deltoid and greater pectoral muscles have been partially removed, and the muscles inserted into the greater tuberosity reflected.

From a woman aged 76.

"The head of the humerus is situated immediately under and touching the inferior surface of the coracoid process, the greater part external to a line falling vertically from the tip of the process. It is somewhat rotated inwards, the great tuberosity facing directly forwards, the bicipital groove inwards. The articular surface of the humerus is flattened and elongated downwards by an overhanging growth of new bone in this direction. The articular cartilage on the inner side of the head, and also on part of the anterior margin, where it is in contact with the capsule of the joint, is unaltered. On other parts, where in contact with the new socket of the scapula and over the enlarged osseous surface, it is entirely removed in small patches, leaving the bare bone exposed, in some places eburnated, in others porous ; but in the greater part the place of the cartilage is occupied by a spongy fibrous material of irregular thickness.

"A complete new socket is hollowed-out on the inner surface of the neck of the scapula, encroaching upon the glenoid fossa, of which the inner third is absorbed. This socket is lined by a thin layer of soft, flocculent, imperfectly formed fibrous tissue. The cartilage remaining in the old glenoid fossa is covered with a dense mass of fibrous tissue connected with the capsule of the joint. On the inferior part of the capsule are two irregular nodules of bone, rather larger than peas, projecting inwardly. The tendons of the posterior scapular muscles are not injured, but stretched across the front of the glenoid cavity. The great tuberosity of the humerus is not detached. The short tendon of the biceps and those of the coraco-brachialis and pectoralis minor are displaced, being stretched over the head of the humerus. The long tendon of the biceps is torn, and has contracted a new adhesion to the margin of the bicipital groove. A cast of the shoulder is preserved."—*Notes of the dissection, by Professor Flower.*

Presented by John E. Erichsen Esq., 1865.

1749. The bones of a shoulder-joint. A subcoracoid dislocation had existed for some time before death ; and a new articular surface has been formed on the anterior and inner edge of the glenoid cavity. The humerus has also articulated with the coracoid process, which is expanded and smooth. Both the head of the humerus and the new articular surface of the scapula are partly eburnated ; and the edges of each surface are surrounded by irregular deposits of new bone, after the manner of a joint affected by chronic rheumatoid arthritis. The glenoid cavity is roughened but not much diminished in size.

For Notes of the case, see Trans. Path. Soc. vol. xii. p. 179, "On Pathological Changes produced in the Shoulder-joint by Traumatic Dislocation," by Professor Flower, F.R.S. See also MS. Notes, vol. i. p. 261.

Presented by George Busk, Esq., 1871.

1750. A scapula and humerus. The humerus was dislocated backwards. The anterior part of the lesser tuberosity rests in the glenoid cavity. The head of the bone is rotated so that its articular surface looks almost straight backwards ; and part of its anterior border is absorbed. The posterior border of the glenoid cavity, on which the head of the humerus probably rested, has been cut away.

From the Museum of Sir A. P. Cooper.

1751. A shoulder-joint, with fracture and dislocation of the humerus. The fracture has separated, in one piece, the head and lesser tuberosity of the humerus ; and these, dislocated forwards and inwards, lie on the anterior part of the scapula, half an inch below the base of the coracoid process, the articular surface of the head of the humerus being directed almost straight forwards. The tendon of the subscapular muscle retains its attachment to the lesser tuberosity, the broken surface of which is firmly united to the anterior part of the greater tuberosity. The fractured surface of the upper part of the shaft of the humerus, and of the greater tuberosity, is fixed almost immovably in the

glenoid cavity : the tendons of the supraspinatus and infraspinatus muscles are attached, as in the natural state, to the summit of the tuberosity.

From the Museum of Sir A. P. Cooper.

1752. A vertical section of a left shoulder-joint, in which the humerus was fractured and dislocated in the same manner as in the preceding specimen. No osseous union, however, has taken place ; the broken surface of the upper part of the shaft is fixed by a thick layer of ligamentous substance to the surface of the glenoid cavity ; and a large quantity of similar substance has been formed about the dislocated head of the humerus, fixing it to the adjacent parts and almost concealing it. The axillary vessels and nerves are shown passing over, and in close contact with, the articular surface of the dislocated head. The attachments of the pectoralis minor and coraco-brachialis muscles are also shown covering part of the same surface ; and the short head of the biceps muscle lies between it and the upper part of the shaft. *From the Museum of Sir A. P. Cooper.*

1753. The other section, showing the posterior part of the same shoulder-joint, and the bond of union between the fractured surface of the neck of the humerus and the glenoid cavity.

From the Museum of Sir A. P. Cooper.

1754. The bones of an elbow-joint, in which the radius and ulna have been dislocated outwards and partially backwards, and have been fixed by osseous union in their abnormal positions. The olecranon, the coronoid process and the greater part of the sigmoid cavity of the ulna are united to the middle of the posterior surface and margin of the external condyle of the humerus. There appears also to have been a fracture of the border of the external condyle, the fragments of which have been united to one another, and to the surface of the cavity on the head of the radius, by tough and thick ligamentous substance. The articulation between

the radius and ulna is natural ; and the radius, being fixed only by ligament to the humerus, may have possessed considerable freedom of rotation.

From the Museum of George Langstaff, Esq.

1755. The bones of a right elbow-joint, showing an old unreduced dislocation of the forearm backwards. The humerus has formed a joint, with smooth opposed bony surfaces, on the anterior surface of the radius just below its head, which is enlarged and somewhat distorted. The articular surfaces of both the humerus and ulna are altered in shape by the formation of delicate irregular masses of spongy bone along their margins, some formed by upgrowing of the sigmoid cavity of the ulna. The longitudinal section made through these bones shows little alteration in their cancellous tissue, but displays the extreme porosity of the new outgrowths.

From a woman aged 64, who died from apoplexy and post-pharyngeal abscess. The accident which caused the injury was believed to have occurred thirty years before death ; whether fracture occurred as well as dislocation is uncertain. The joint could not be extended, but could be flexed, pronated, and supinated.

Presented by Dr. T. S. Dowse, 1874.

1756. The lower end of a humerus, with a radius and ulna. The radius was dislocated backwards ; and that which was the outer margin of its head is now turned forwards, and is in contact with the posterior margin of the external condyle. The shaft of the radius is fixed in extreme pronation ; and both it and that of the ulna are flattened where they cross each other. *Hunterian.*

1757. A humerus, radius, and ulna. The ulna was dislocated outwards and the radius forwards. The great sigmoid cavity of the ulna now articulates with a deeply grooved surface on the lower part of the external condyle of the humerus, and the inner lateral surface of the olecranon articulates with the inner border of the trochlea. The head of the radius rests upon the anterior surface of the external condyle, directly in front of the ulna. The bones are little

altered in form. The joint appears to have possessed a limited mobility, and to have been habitually flexed with the radius and ulna in a plane parallel with the axis of the humerus.

1758. The lower end of a humerus, with the bones of the forearm and of part of the hand. The radius was dislocated forwards and upwards; and its head (part of which has been broken-off, apparently after death) rests on the front and outer part of the humerus an inch above the lower border of the outer condyle. In this position it is united to the humerus; and osseous union has also taken place between it and the ulna, and between the articular surfaces of the ulna and the humerus. In adaptation to the shortening of the forearm by the dislocation of the radius, the lower end of the ulna is remarkably bent forwards and nearly dislocated from its radial articulation. Its articular surface also is turned forwards, and, in correspondence with this change, the width of the carpus is diminished. The ring- and little fingers are absent, but probably were removed after death.

1759. The bones and parts of the ligaments of an elbow-joint. The radius and ulna were dislocated outwards, carrying with them the outer half of the articular end of the humerus, through which two fractures extended in oblique lines from the outer margin into the joint. The dislocated parts were not reduced, and appear to have remained a long time in their present position. The edges of the fractured portions of the humerus are rounded-off and smooth; but no union has taken place between them. The inner margin of the olecranon rests against the outer part of the trochlea of the humerus. All the articular portion of the ulna is misshapen; and on the coronoid process there is a flat smooth surface, over which the biceps muscle probably was stretched. The head of the radius is enlarged and flattened; it retained its articular connexion with the ulna and with the outer condyle, which was broken-off and dislocated with it. The several parts of the joint appear to have been capable of motion. *From the Museum of Joshua Brookes, Esq.*

1760. A left hand showing dislocation of the first phalanx of the little finger backwards on the fifth metacarpal bone. The capsule of the metacarpo-phalangeal joint has been torn through; the head of the metacarpal bone projects towards the palm, and the tendons inserted into the base of the phalanx have slipped behind it.

From an old man who received the injury in a street-accident, the consequences of which proved rapidly fatal from damage to internal organs. The dislocation was not reduced.

Presented by Edward Hacon, Esq., 1879.

1761. The bones of a hand. The carpal end of the fourth metacarpal bone has been dislocated backwards, and half its articular surface has lost its relation to the unciform bone. Its radial margin is united by bone to the adjacent margin of the third metacarpal bone. *Hunterian.*

Dislocations in the Lower Extremity.

1762. A right hip-joint from a case of recent dislocation of the femur onto the dorsum ilii, reduced after death. The capsule has been ruptured at its lower and inner aspect, and detached from the back of the neck of the femur as far as the digital fossa, the head of the femur having been driven through it when the thigh was violently abducted. The detached portion hangs down as a loose flap. The obturator externus muscle, which was partially lacerated, has been removed; the pyriformis, gemelli, and obturator internus are dissected to show the extent of laceration they have sustained. A comminuted fracture through the junction of the pubis and ilium extends into the acetabulum; and a fracture extends obliquely through the ramus of the ischium.

From a cabman aged 29, who received several severe injuries, when violently pushed by the wheel of his cab against a shop window, in endeavouring to stop his horse. He died in a few minutes. For a full account of the case, see "Dislocations of the Thigh," by Henry Morris, Medico-Chir. Trans. vol. lx. p. 161.

Presented by Henry Morris, Esq., 1877.

1763. Section of a hip-joint, in which the femur was dislocated backwards and not reduced. The section was made in a horizontal plane through the lower part of the ilium, an inch above the spine of the ischium, and through the head and neck of the femur and the great trochanter. The head of the femur rests on the upper part of the ischium, with its lower margin on a level with the spine of that bone; the great trochanter is directed outwards; the shaft almost horizontally forwards. The inferior and inner surface of the head and neck is united by ligamentous tissue to the surface of the upper part of the ischium. A capacious and thick capsule encloses the dislocated head and neck. The acetabulum is reduced in size and filled with a tough ligamentous tissue. The cartilage on that part of the head of the femur which is not adherent to the ischium is thin, and its surface is uneven. *Hunterian.*

1764. The upper section of the same hip-joint, exhibiting more distinctly the layer of ligamentous tissue uniting the inner surface of the head and neck of the femur to the outer surface of the ischium, and showing that the end of the round ligament, which was torn away from the bottom of the acetabulum, has become firmly adherent to the inner surface of the capsule, near its attachment to the posterior and inferior spine of the ilium. *Hunterian.*

1765. A hip-joint, exhibiting the effects of dislocation of the femur many years before death. The head of the femur rested on the outer part of the body of the os pubis, in contact with the anterior inferior spine of the ilium; and the posterior surface of the neck and great trochanter rested on the lower part of the ilium and the upper border of the acetabulum, extending backwards to the ischium. The surfaces of the ilium and os pubis have been exactly adapted to the form of the upper part of the femur thus placed in contact with them, and bone has been formed in an elevation which fitted in the concavity of the neck of the femur. In this adaptation of surfaces the acetabulum is obliterated by the lowering of its border, as well as by the formation of

ligamentous tissue in it ; some of which tissue, also, extending over the adjacent part of the ilium, appears to have formed adhesions between it and the trochanter and neck of the femur. The head of the femur, deprived of cartilage, is hardened on its surface and conical. The whole head, neck and trochanter of the femur are enclosed in a thick and very strong new capsule of ligamentous tissue, the upper border of which is attached to the ilium and os pubis, above and in front of the surface adaped to the dislocated femur.

Presented by William Lynn, Esq.

1766. The bones of a left hip-joint. The femur was dislocated into the obturator foramen long before death. Its head is lodged inextricably, but with free capacity for motion, in a cavity bounded by new bone, which has been formed within the obturator foramen and in deep ridges around its borders. This new osseous articular cavity is almost regularly hemispherical, its inner wall forming a deep convex prominence in the pelvis in the situation of the obturator foramen, and its margin being imperfect in only a small extent at the inner part. Anteriorly and externally the margin of the cavity presents an irregular projection of new bone, which has grown inwards and locked-in the head of the femur. The cavity of the old acetabulum remains, but is much contracted, and its inner part is traversed by the high margin of the new articular cavity. The head of the femur has nearly retained its natural form, though deprived of its articular cartilage and in parts artificially ulcerated. The neck is of its natural length, but grooved and irregular, in correspondence with the form of the walls of the new acetabulum.

There is every appearance that the limb from which these parts were taken possessed almost all its original mobility, though it must have been nearly two inches longer than the other.

Purchased.

1767. The corresponding ends of a femur and tibia, with the patella. The tibia was dislocated forwards and a little outwards ; and, in this position, new articular surfaces are formed on the upper and back part of the tibia, in adaptation to the

condyles of the femur. The outer border of the external condyle rests in a deep groove on the middle and back part of the external articular surface of the tibia; and the surface of the inner condyle is adapted to a broad slightly concave surface, worn down upon the upper and posterior margin of the internal articular surface of the tibia. The patella retained its natural relation to the femur. All the articular cartilages were removed. The subjacent bones are porous, except where they moved on each other; on those parts they are hard and smooth. New bone has been abundantly formed around their articular ends and upon their shafts.

The cause of this dislocation is not known; it was probably the result of injury.

Hunterian.

1768. An ankle-joint, in which the tibia had been long dislocated. Nearly all the articular cartilage has been removed; the small and thin isolated portions which remain are fixed firmly to the subjacent bone. The surfaces of the tibia and astragalus are smooth and hard, and parts of them are covered with false membrane, by one large band of which they are united together. *Hunterian.*

1769. A right ankle-joint, with the parts immediately surrounding it. The shafts of the tibia and fibula are dislocated inwards; the inner malleolus, broken-off, retains its connexion with the os calcis; and the fibula is broken and splintered about an inch and a half up its shaft. The tendons of the anterior tibial and extensor muscles have slipped outwards; but those of the outer muscles are little displaced. The sole of the foot is directed obliquely outwards.

From a man twenty-eight years old. Some stones fell on him as he was working in a stone-pit and, in addition to this injury, fractured the os pubis. He died on the eighth day after the accident.

A further account of the case is given in the "Treatise on Diseases and Injuries of the Nerves, by Joseph Swan." Ed. 1834, p. 310.

Presented by Joseph Swan, Esq.

1769 A. The bones forming an ankle-joint, with the os calcis. The astragalus, with the other bones of the foot, is displaced

backwards and rotated outwards, so that the posterior part of the articular surface of the tibia rests on the middle of the articular surface of the astragalus. The cartilage of both bones was at this point destroyed ; elsewhere they were united by fibrous tissue. The fibula is ankylosed to the tibia ; and some callus is formed where a portion of the external surface of the extremity of the tibia appears to have been broken-off.

From a man aged 53, who stated that two years previously he had slipped and broken his leg. The foot was everted, the heel projected backwards, and the ankle was stiff, painful, and useless. See Trans. Path. Soc. vol. xxxiii. p. 281.

Presented by H. A. Lediard, Esq., M.D., 1882.

1770. The bones of a left ankle-joint and foot. The astragalus has been completely dislocated from its articulation with the os calcis, and carried inwards with the tibia and fibula. It remains connected with the scaphoid and has sunk nearly an inch below its right level. The tibia and fibula were not injured in the dislocation ; the external malleolus appears to have passed behind the elevated articular surface of the os calcis, as if the dislocation had been produced in a forcible rotation of the foot inwards : the point of the malleolus rests on the inner and posterior margin of the tuberosity of the os calcis. In its new position the astragalus is fixed by bone to the adjacent inner and lower surfaces of the os calcis. The tendons of the peronei muscles appear to have slipped from behind the external malleolus ; for there is a deep grooved channel of new bone formed by the side and in front of the lower part of the fibula, in which it is probable that they were contained. The sole of the foot is flattened, but not otherwise altered in form or direction.

From the Museum of John Howship, Esq.

1771. The bones of an ankle-joint and foot. There has been a comminuted fracture of the lower ends of both the tibia and fibula; and the tibia has been pushed forwards and outwards, half over the astragalus. The malleoli, which were both broken off, have retained their places, though drawn rather forwards near their junction with the shafts. All the frac-

tured portions are firmly united; and the several articular surfaces of the ankle-joint have been ulcerated and closely united by bone. *Presented by Anthony White, Esq.*

1772. The bones of a foot, and the lower parts of a tibia and fibula. After dislocation of the tibia and fibula outwards, with fracture of both malleoli, and a vertical fracture of the articular portion of the tibia, the parts appear to have been reduced and partially re-united. The fracture of the fibula is repaired; and new bone has been formed about the margins of the fractured portions of the tibia, but they are not united. Parts of the articular cartilages of the ankle are removed, and the ends of the bones are superficially ulcerated. The sole of the foot, especially its anterior part, is turned inwards.

From the Museum of Sir A. P. Cooper.

1773. A left astragalus, excised after compound dislocation forwards. The projection at its posterior aspect, which forms the pulley for the tendon of the flexor longus pollicis, together with the adjacent part of the posterior facet on the under surface of the bone, was torn away when the dislocation took place.

The patient was a bricklayer's labourer, who fell sixty feet into a well. He was treated at home for a fracture; but sloughing of the integument occurred at the end of a month; and the true nature of the accident being then detected, excision of the bone was performed. He recovered without a bad symptom, and was able to walk well seven months after the accident. (Trans. Path. Soc. vol. xxiii. p. 193.)

Presented by T. Carr Jackson, Esq., 1872.

1774. An astragalus, together with a portion of the posterior articular surface from the upper aspect of the os calcis, excised after compound dislocation.

Presented by T. Carr Jackson, Esq., 1875.

Artificial Distortion.

The following nine preparations of the feet of Chinese women, showing the effects of compression applied at an early age, were made from four specimens presented to the College by Mrs. Stanley, widow of Dr. S. S. Stanley, R.N., and from one presented by William Lockhart, Esq.

1775. The left foot of a young Chinese female, in which the compressing process has been only partially carried out. The great toe is turned outwards; the others, especially the little toe, are doubled under the sole of the foot; the first and third, being pressed towards each other, meet beneath the second, which is consequently displaced upwards. There are two circular ulcers on the skin, perhaps the result of artificial pressure, one over the distal extremity of the fifth metatarsal bone, the other nearer the instep. As in most of the other specimens, the cuticle has been removed, probably by partial decomposition before they were preserved.

1776. A right foot in a similar condition, and probably belonging to the same individual. There are numerous ulcers and cicatrices on the surface.

1777. The left foot of a Chinese female in a more advanced condition of distortion. The toes are bent as in the preceding specimens; but in addition the point of the heel is brought downwards and forwards, so as greatly to increase the arch of the foot and prominence of the instep, while the length is much diminished. The skin is removed, and the muscles and tendons are dissected. These have their normal distribution, except that the extensor brevis digitorum sends an accessory slip to the little toe, and there is a small muscle, the origin of which in the back of the leg is lost, but which ends in a tendon, about an inch long, inserted into the under surface of the fibrous sheath which binds the tendon of the peroneus longus to the os calcis.

1778. The skin, without the cuticle, from the above foot. It shows the general external form, especially the deep transverse cleft across the middle of the sole.

1779. Part of the left foot of an adult Chinese female in a similar state of distortion. It has been roughly chopped off the limb, through the tarsal bones, which are much shattered. The skin and fleshy coverings of the metatarsal bones and phalanges have been dissected off. The integuments of the heel remain, including the cuticle, which is of considerable thickness.

1779 A. A similar specimen, with the bones dried.

1780, 1781. Two longitudinal vertical sections of a highly distorted right foot. The deformity is of the same nature as that shown in the preceding specimens, but carried to a greater degree. The foot is much shortened and bent upon itself, by an exaggeration of the natural arch. The heel and the distal ends of the metatarsal bones are brought as near together as possible, the lower tarsal bones being forced up, so as to make a considerable prominence on the instep. The outer toes are doubled under the sole. The great toe is comparatively little altered, its extremity being only directed to the middle line of the foot, to which it forms the pointed anterior termination. Although the tarsal bones are considerably changed in form and relative position, their structure, as well as that of the articular cartilages, appears healthy.

1782. A portion of the skin from the heel of the foot in No. 1779. The cuticle is upwards of an eighth of an inch in thickness and much fissured.

1783. A similar specimen.

1784. The nails from the first and second toes of the same foot.

1785. The right foot of a man, showing one of the modes in which the feet are distorted by the boots often worn in England at the present day. The anterior part of the foot

forms a triangle, the apex of which is in the middle line of the foot. The great toe, instead of being in a straight line with its metatarsal bones, forms an angle of 110° with it. The other toes are similarly everted. The muscles and tendons are partially atrophied.

From a Dissection-subject, 1868.

Diseases of Synovial Membrane.

Effusions of Lymph and Fluid—Thickening—Formation of False Membranes, &c.

1786. A patella, with the tissues in front of a knee-joint. The section of the synovial membrane displays it increased to from two to three lines in thickness, and converted into a uniform, pale, fawn-coloured, close texture, contrasting strongly with the fat and tendinous structures on which it is applied. ["Pulpy degeneration."] Its inner surface is nearly smooth and very like that of a pale mucous membrane. A large mass of granulations, under which a bristle is passed, extends into the knee-joint from the orifice of a fistulous passage through the skin by the side of the patella. The greater part of the articular cartilage of the patella has been removed by ulceration. *Hunterian.*

1787. A portion of synovial membrane, from the side of a patella, thickened, indurated, and coarsely granulated on its free surface. *From the Museum of John Howship, Esq.*

1788. "The cavity of the knee-joint, very much enlarged, and its internal surface inflamed."—*Hunterian MS. Catalogue.*

A vertical section of the knee-joint. The greater part of the articular cartilages has been removed, and the exposed surface of the femur is thinly covered with granulations. The cavity of the joint is so distended that it reaches nearly four inches above the upper margin of the patella, forming a kind of sac between two and three inches deep, and extending across the whole front of the thigh. The synovial membrane is covered with thin flakes of lymph and much thickened.

1789. A vertical section of a knee-joint, in which the articular cartilages have been removed and the greater part of the exposed surfaces of the bones has been united by compact soft tissue. The anterior and upper part of the cavity of the joint is not obliterated; the section exhibits synovial membrane extending far upwards in front of the femur, and uniformly lined with a thin, wrinkled and granular layer of firm lymph, which is also continued over the exposed portion of the front of the femur. The medullary tissue of the bones has been removed in making the preparation; their walls are very thin, but the remains of their substance appear healthy. *Hunterian.*

1790. A vertical section of the lower end of a femur and of some of the adjacent tissues, from the knee-joint last described. The extension of synovial membrane above the knee-joint appears to be the lining of the suberural bursa, which opened into the joint and was diseased like the articular synovial membrane. *Hunterian.*

1791. A thin vertical section from the same knee-joint.
Hunterian.

1792. "A knee-joint, nearly obliterated by soft union."—*Hunterian MS. Catalogue.*

All the articular cartilages have been removed. The synovial membrane is thickened, and its surface, as well as that of the bones, is covered with a thick granulated layer of lymph, some of which has been reflected and hangs in loose shreds.

1793. The right knee-joint of a child, laid open from the front. The whole of its interior is coated with a thick layer of lymph, the opposed surfaces of which are becoming united at the back part of the inner condyle. There are numerous sinuses and cicatrices in the skin around the joint, indicating disease of long standing.

Presented by John Adams, Esq., 1868.

1793 A. A section of an inflamed knee-joint with the blood-vessels injected. The synovial membrane is thickened; and its inner surface is lined by a layer of lymph. The vascularity of the bones is increased; and the separation of the articular cartilages has, in some places, commenced by the sprouting of capillaries from the articular surfaces of the bones into the cartilage (subchondral caries).

The specimen was taken from a strumous child, whose hip-joint on the same side was also diseased.

Presented by Frederic S. Eve, Esq., 1881.

1794. A right knee-joint laid open, showing thickening of the whole synovial membrane. The cartilage of the femur is extensively ulcerated from without inwards; that of the tibia is similarly affected, but to a less extent.

From a man about 25 years of age, subject, for several years, to disease of the joint. Suppuration occurring, amputation became advisable. The patient died of pyæmia twelve days after the operation.

Presented by T. Carr Jackson, Esq., 1872.

1795. A vertical section of an astragalus and os calcis. A thin layer of organized lymph lies between the articular cartilages, which are themselves of natural thickness and appear healthy. *Hunterian.*

1796. A vertical section of the lower end of a tibia, an astragalus and part of an os calcis. Thin layers of organized lymph are formed in the articulations; but the cartilages appear healthy. *Hunterian.*

1797. A portion of the lower end of a tibia, showing its articular cartilage of ordinary thickness and not altered in structure, but covered with a thin layer of vascular lymph.

Hunterian.

1798. An astragalus, with a narrow band of organized lymph passing from the outer part of its articular cartilage to the

synovial membrane lining the posterior ligament of the ankle-joint. Similar small shreds of lymph are, also, attached to the surface of the cartilage in front of this adhesion.

Hunterian.

1799. A vertical section of the lower end of a femur, with part of the patella. The greater portion of the articular cartilage has been removed from the femur. That which remains on the anterior part of the condyle is nearly all firmly attached to the bone, but very thin, and its free surface is in several places grooved and made irregular by the ulceration, which, in this case, appears to have proceeded chiefly from the free, towards the attached, surface of the cartilage. The cartilage of the patella is similarly ulcerated on its free surface. A broad band of membrane extends from the back of the patella to a part of the cartilage remaining on the femur: "which [as Mr. Hunter stated in the MS. Catalogue] shows that cartilage of the joint is capable of taking-on adhesions." The exposed surface of the femur appears to be slightly ulcerated; but the substance of the bone is healthy. *Hunterian.*

1800. A vertical section of a knee-joint, in which a small band of membrane passes from between the condyles of the femur to the cartilage in front of the spine of the tibia. A portion of lymph is also attached to the anterior margin of the articular cartilage of the femur. *Hunterian.*

1801. A knee-joint, in which acute inflammation was excited by ulceration spreading into it from an issue made near the outer side of the patella. The ulcerated passage is between two and three lines in diameter; a portion of whalebone is placed in it. The articular cartilage of the femur is slightly ulcerated on part of its free surface; and a broad band of soft and vascular false membrane extends across part of the surface of the inner condyle, and from its cartilage to that of the patella, of which it covers the greater part. Another and thicker band of adhesion extends from the synovial

membrane, just below the aperture into the joint, to the opposite part of the external condyle.

From the Museum of Robert Liston, Esq.

1802. A knee-joint, the cavity of which is completely obliterated by tough adhesions. The patella has been forcibly torn away from the outer condyle of the femur, to which it was united by bone. All the articular cartilages have been removed; and the exposed surfaces of the bones (where they were not ossified together) are rough, nodulated, and covered with an irregular layer of tough fibrous tissue, intersected by glistening bands. *Hunterian.*

1802 A. The anterior half of a vertical section of the bones forming the radio-carpal joint of a Horse. The joint was much enlarged by thickening of the synovial membrane and tissues around it, and contained an excess of synovial fluid. The sheaths of the tendons on the anterior surface of the joint were distended, and contained much fluid. The sheath of the tendon of the anterior extensor of the metacarpus is laid open, and the tendon is turned aside; it is adherent to its sheath. At the lower part of the groove for the tendon shown in the specimen a large hernial dilatation of the synovial membrane of the joint has taken place, the orifice of communication of which with the transverse intercarpal joint is indicated by the posterior extremity of a glass rod passed through it. At a corresponding situation in the groove for the extensor tendon of the phalanges is a smaller lobulated dilatation of the synovial membrane. The disease giving rise to these changes was apparently synovitis and teno-synovitis, and was reported to have been congenital.

Presented by Alfred Willett, Esq., 1882.

Principal specimens of Diseases of the Synovial Membrane in other parts of the Museum :—

Nos. 149, 189, 190, 973, 976, 978, 1042, 1406.

Formation of new synovial membrane: 817 to 823.

Diseases, chiefly Ulcerative, of Articular Cartilages and the Articular Surfaces of Bones.

Illustrations of modes of Ulceration of Articular Cartilage: 1803 to 1823.

Ulceration of Articular parts of Bones of the Upper Extremity: 1824 to 1843.

Ulceration of Articular parts of Bones of the Lower Extremity: 1844 to 1856.

Similar Affections of the Hip-joint: 1857 to 1897.

1803. A knee-joint, from which the articular cartilage has been in several places removed by ulceration extending from the free towards the attached surface. The disease affected especially the cartilage of the femur, of which a large portion has been completely removed. The surface of the exposed subjacent bone is smooth, hard, and apparently quite healthy. The portions of cartilage which remain appear to be of healthy texture, and firmly adherent to the bone; some of these portions are thin and uneven on their free surface; others are of the ordinary thickness, and have smooth external surfaces: of the latter, the edges invaded by the ulceration are sharp and abrupt; but the edges of the former become gradually thinner. The progress of the disease by which these changes were produced is well shown near the inner border of the patella, where the same kind of ulceration was destroying a small circumscribed portion of the articular cartilage. The ulceration of this part, becoming gradually more limited in extent as it proceeded to a greater depth through the cartilage, had only at its centre reached the surface of the bone. The synovial membrane is more than usually vascular, and somewhat thickened; shreds of lymph are attached to some parts of its surface.

From the Museum of Robert Liston, Esq.

1804. The lower end of a femur, from which nearly the whole of the articular cartilage, except its borders, has been removed by ulceration extending from the free towards the attached surface. Of the central parts of the cartilage only a few

exceedingly thin portions remain. The edges of the portions which remain at the borders of the condyles are bevelled towards the surface of the exposed bone, on which, as they become thinner, they are gradually lost. The texture of the cartilage and its connection with the bone appear quite natural. *Hunterian.*

1805. The proximal row of the bones of a carpus. Large portions of the articular cartilages have been similarly removed by ulceration. The portions of cartilage which remain are firmly adherent to the bone, and their margins are very thin, though not so smoothly bevelled as in the preceding specimens. The exposed surfaces of bone appear healthy. *Hunterian.*

1806. A patella, from which one half of the cartilage has been removed, apparently by the same mode of ulceration as is shown in the foregoing specimens. The borders of the remaining portion are closely fixed to the bone and shelve gradually towards its exposed surface. Part of the exposed bone is superficially ulcerated, and a thin layer of lymph has been formed on it. *Hunterian.*

1807. "The knee-joint of a boy, who had a white swelling come to suppuration."—*Hunterian MS. Catalogue.*

Nearly the whole of the articular cartilage is removed from the internal condyle and the trochlea of the femur: a small isolated portion, thinned by ulceration of its free surface, and partially detached from the subjacent bone, remains alone upon the trochlea. The cartilage of the external condyle appears healthy, both in texture and connection with the bone: it presents a thick and slightly shelving margin at the limit of the ulceration. The bone exposed by the ulceration, and probably itself superficially ulcerated, is covered with granulations, which are very thick and prominent at its outer border. The cartilage over the patella is healthy. The synovial membrane is thickened, especially on the inner side; and bristles set on this part of

it, in a line with others fixed at the borders of the thick granulations on the femur, appear to indicate that the inner part of the cavity of the joint was separated from that part which has remained healthy, by a partition formed by the adhesion of the synovial membrane to the front of the femur. *Hunterian.*

1808. An astragalus, from the upper and lateral surfaces of which all the articular cartilage, except a thin strip of its anterior border, has been removed, probably by ulceration extending from the free surface. The whole of the upper part of the exposed surface of bone, except the anterior and inner angle, is superficially ulcerated, very vascular and covered with lymph and granulations. The anterior and inner angle is deprived of cartilage; but its surface looks healthy. All the adjacent parts of the joint appear to have been acutely inflamed. *Hunterian.*

1809. A knee-joint, from which nearly all the articular cartilages have been removed: isolated portions alone remain; and these are thin and uneven on their free surface, but, for the most part, firmly attached to the subjacent bone. The bones exposed by the removal of the cartilages are covered with granulations and lymph. The synovial membrane is thickened, especially round the borders of the cartilages; and thick layers of granular lymph are deposited on parts of its free surface.

The patient was a man 27 years old. The disease was of long standing, and his health was much impaired. When the limb was amputated there were ten ounces of pus in the joint.

From the Museum of Robert Liston, Esq.

1810. A knee-joint, with the surrounding tissues, injected. The synovial membrane is highly vascular, and the cartilages are much destroyed by ulceration; which has exposed large portions of the subjacent very vascular bone.

From a man aged 45. His knee-joint having been inflamed

for three months, he was kept at rest for two months; but as the state of the joint did not improve, amputation was performed.

Presented by John Adams, Esq., 1867.

1811. A longitudinal section of a left foot, injected. The synovial membrane of the ankle-joint is very vascular, the cartilages are completely destroyed, and the vascularity of the bone beneath them is abnormally increased. The openings of several sinuses in communication with the joint may be seen in the integuments.

From a man, 37 years of age, of feeble constitution. He had been employed many years in a shop, standing or running up and down stairs during the whole of the day. The symptoms of disease of the ankle-joint commenced with pain and swelling two years before operation. He had no treatment for some months, but subsequently kept the left leg more or less entirely on a horizontal leg-rest, the joint being blistered and strapped. Sinuses then formed, and the leg was amputated. He left the hospital in good health.

Presented by John Hilton, Esq., 1863.

1811 A. A section of a right foot, affected with elephantiasis. A tough adhesion extends between the astragalus and the lower end of the tibia. The articular cartilage is deficient at the attachments of this band. The thickened and rigid integuments formed for several years a perfectly immovable case round the foot; and the atrophy of the cartilages of the ankle-joint may be partly due to this condition.

From a man aged 67, who had never been out of England, and who denied ever having suffered from syphilis. Twelve years before the right leg was removed a small round spot appeared on his skin, from which swelling extended upwards and downwards and gradually increased, subsiding temporarily under rest. At length the skin of the whole leg and foot became thickened and tuberculated. The limb was subjected to repeated counter-irritation; and abscesses formed in the cellular tissue; it was therefore amputated. There was no history of disease of the ankle-joint.

Presented by J. Cooper Forster, Esq., 1873.

1812. A vertical section of a knee-joint. The articular cartilage

is nearly all removed from the head of the tibia, and the exposed surface of bone is covered with lymph. The cartilage of the patella appears healthy; of that of the femur, the posterior part has been nearly all removed by irregular ulceration, and the exposed bone is covered with flakes of lymph. Anterior to this irregular ulceration, the adjacent border of the remaining cartilage is gradually thinned towards the bone; a large portion of its free surface is soft, rough, and perforated by numerous small circular ulcers, which penetrate deeply into its substance. A few of these small ulcers have coalesced; and those at the very border of the cartilage are of larger size and have reached the surface of the bone. The synovial membrane is thickened and consolidated with the surrounding tissues. The bones appear healthy. *Presented by Sir William Blizard.*

1813. The upper end of a tibia, the cartilage of which is ulcerated in the same manner as that of the condyle of the femur last described. On one of the semilunar fossæ a large portion of the surface of the cartilage appears soft, and is rough and perforated by a few round apertures. From the other fossa the greater part of the cartilage has been wholly removed. The subjacent bone appears very vascular on its exposed surface. *Hunterian.*

1814. One of the condyles of a femur. The articular cartilage is superficially and irregularly ulcerated on nearly all its free surface; its outer border is the only part which remains unaltered. The whole of the ulcerated part of the cartilage easily separated from the bone, which is itself superficially ulcerated, but in its interior appears healthy. Of that surface of the cartilage by which it was attached to the bone, the greater part appears healthy in form and texture; some of it has minute spicula of the ulcerated surface of the bone fixed to it; and some appears ulcerated after the same manner as the free surface. *Hunterian.*

1815. The patella, with the adjacent parts, from the same knee-

joint. The connexion between the cartilage and the bone is almost wholly destroyed, and the cartilage has been nearly all reflected. The greater part of the under surface of the cartilage thus exposed appears healthy; its free surface is superficially ulcerated. The surface of the bone beneath the reflected cartilage is thinly covered with lymph or granulations. "This person had a white swelling."—*Hunterian MS. Catalogue.*

1816. The end of a metacarpal bone, from which the articular cartilage, after being softened and made irregular by previous disease, is nearly all separated in one piece. The subjacent bone is superficially ulcerated, and covered with a thin layer of transparent jelly-like substance, probably macerated granulations. *Hunterian.*

1817. One of the condyles of a femur. A large portion of its articular cartilage has been wholly removed by ulceration. The remainder, thinned, uneven on both its surfaces, and in several places perforated, is fixed to the bone by its outer border alone. The exposed surface of the bone is covered with granulations; its interior appears healthy. What remains of the synovial membrane is thickened, and forms a deep swollen border overlapping the outer edge of the cartilage. *Hunterian.*

1818. One of the condyles of a femur, from which two large portions of the articular cartilage were nearly detached by superficial ulceration of the bone, and of the surface by which they were fixed to it; their free surfaces are healthy. In the middle of the condyle a large portion of the whole thickness of the cartilage has been completely removed; and its place is occupied by a soft tissue, continuous with the thickened synovial membrane round the border of the articular surface. At the anterior part, also, the whole thickness of the outer border of one of the nearly detached portions of cartilage has been removed; and its place is in like manner occupied by the thickened synovial membrane,

with which the soft tissue just mentioned is continuous. The bone, superficially ulcerated, has been painted red, to make the separation of the cartilage more manifest.

Hunterian.

1819. The bones of an ankle-joint, from the articular surfaces of which, after the removal of the cartilages, abundant vascular granulations have been produced. *Hunterian.*

1820. A knee-joint, of which the blood-vessels have been minutely injected. The greater parts of the articular cartilages have been removed from all the bones. The portions which remain are thin strips of their borders, and some larger pieces on the patella and on the posterior parts of the condyles of the femur. These portions are all ulcerated on their free surface; they are also, in many places, separated from the subjacent bone by a layer of lymph, and at their borders are surrounded with granulations which fit into all their irregularities. The surface of the exposed bone is very vascular, ulcerated, and covered with lymph. The synovial membrane is thickened. The tibia and fibula are drawn backwards; and the crucial ligaments are elongated.

From a case of acute inflammation of the joint following, it is believed, a penetrating wound.

Presented by Sir William Blizard.

1821. One of the condyles of a femur. At its anterior part a portion of articular cartilage has been separated after ulceration of the surface of the bone, on which there is now a thin layer of granulations. Another portion of cartilage in this situation has been wholly removed; and the bone here exposed appears to be covered with a thin layer of false membrane, portions of which also are fixed in flocculi to an adjacent superficially ulcerated part of the cartilage. On the posterior aspect of the condyle another circumscribed portion of cartilage appears thinned by ulceration of its free surface, and is covered with fine flocculi of false membrane.

Hunterian.

1822. The carpal ends of a radius and ulna. All the articular cartilage is removed from the radius ; and the exposed surface of bone is covered with a thick layer of compact and vascular false membrane. *Hunterian.*

1823. A finger, with part of its metacarpal bone. The articular cartilages have been in part removed from the corresponding ends of the metacarpal bone and first phalanx ; and the exposed surfaces of bone are covered with granulations.
Hunterian.

Ulceration of Articular parts of Bones of the Upper Extremity.

1824. A scapula, clavicle, and humerus, exhibiting the further progress and accompaniments of the ulceration of the articular portions of bones shown in many of the preceding specimens. The greater part of the head of the humerus is destroyed by ulceration, which has also formed a deep cavity in the top of the shaft, and has removed part of the great tuberosity. The glenoid cavity is superficially ulcerated ; and the surfaces of all the bones adjacent to the shoulder-joint are covered with abundant formations of new bone. The bone exposed by the ulceration has the aspect of healthy cancellous tissue, and, at the anterior part of the cavity formed in the head of the humerus, is partially covered with a thin layer of compact tissue, as if a process of healing had there commenced.
From the Museum of Robert Liston, Esq.

1825. A scapula, in which the glenoid cavity is deeply and irregularly ulcerated, and altered in form by the removal of its anterior and posterior margins and the heaping-up of new bone above and below it. *Hunterian.*

1826. A scapula and humerus, the corresponding articular surfaces of which are ulcerated. The ulceration is for the most part superficial, and has affected equally the whole

articular surface of each bone ; but it has made three deep circular pits in the head of the humerus, and has destroyed the borders of the glenoid cavity. New bone has been formed around the diseased joint ; and the bones bear in every part marks of increased vascularity. *Hunterian.*

1827. A scapula and humerus, of which the corresponding articular surfaces have been wholly destroyed by the further progress of such ulceration as is shown in the preceding specimen. The head of the humerus has been removed, and a deep irregular cavity formed in the upper part of the shaft. The glenoid cavity is destroyed ; a deep narrow cavity is formed in the adjacent part of the scapula ; and the ulceration has extended into the base of the coracoid process. New bone has been abundantly formed around and for some distance beyond the diseased joint : it is hardened ; and there are no marks of increased vascularity in the adjacent parts of the bones : probably the ulceration had ceased to make progress. *Hunterian.*

1828. A left scapula and the upper part of the humerus. The superficial layers of the articular surfaces have been destroyed by ulceration, and several deep rounded pits have been excavated in the cancellous tissue of both bones. New bone has been deposited around the margin of the glenoid fossa and, in a very delicate layer, upon both dorsal and ventral surfaces of the scapula.

From a strong, healthy seaman, who, having been thrown from a height, in falling caught hold of a rope with his left hand, by which he had to suspend himself for some time before he could be extricated. Violent inflammation of the shoulder-joint came on, resulting in the formation of abscess, and ultimately in the death of the patient.

Presented by Sir Stephen L. Hammick.

1829. A humerus, of which a great portion of the head has been removed by ulceration. Nothing of it remains but a low conical projection, with an even surface of apparently healthy cancellous tissue. *Hunterian.*

1830. The left humerus of a Horse. The head has been nearly destroyed by deep and irregular ulceration. Cavities of various depths are formed between it and the tuberosities; and its border, as well as the greater part of the ulcerated surface, is covered with thick deposits of spongy new bone.

From the Museum of Joshua Brookes, Esq.

1831. The bones of an elbow-joint, the articular surfaces of which are superficially and uniformly ulcerated. Very little of the compact laminæ forming the articular surfaces remains. Porous new bone has been formed upon the shafts near the diseased joint. *Hunterian.*

1832. The bones of a right elbow-joint, the whole of the articular surfaces of which are evenly and superficially ulcerated. New bone of spicular form is formed around the margin of the ulcerated surfaces, more especially on that of the ulna.

The disease was caused by the joint having been laid open by a sharp piece of iron.

Presented by Sir Stephen L. Hammick.

1833. The bones of a left elbow-joint, the articular surfaces of which are partially ulcerated. The superficial compact lamina of the greater sigmoid cavity of the ulna, and the corresponding surface of the humerus, are destroyed to a great extent; but the radial side of the articulation is nearly free from disease. Porous new bone, of tubercular and spicular form, has formed around the joint, more especially upon the ulna. Upon the posterior surface of the ulna, commencing two inches below the olecranon, is a large oval deposit, upwards of a quarter of an inch in thickness, compact but with numerous vascular perforations on the surface, and composed of cancellous tissue within.

The disease is said to have arisen without any evident cause.

Presented by Sir Stephen L. Hammick.

1834. The bones of an elbow-joint, in which the articular surfaces and the contiguous bone to some extent have been removed

by ulceration. A large quantity of spongy nodular new bone has been formed around. It is probable that these changes were consequent upon a severely comminuted compound fracture, as lines may bet raced on all the bones, which appear to have resulted from their reunion after such an injury. On the humerus, one passes obliquely from the middle of the articular surface to above the inner condyle, separating the last-named process, with the greater part of the trochlea, from the rest of the bone. The outer condyle, the head of the radius, and the coronoid process of the ulna appear also to have been detached.

Presented by Sir Stephen L. Hammick.

1835. The bones of a left elbow-joint, the articular surfaces of which are destroyed by ulceration. The radius and ulna appear to have been fractured opposite the tuberosity of the former, as their upper ends are placed somewhat obliquely to the shafts; but the patient to whom they belonged asserted that he did not remember any such injury. If this statement is correct, the displacement can only be accounted for on the supposition that portions of the entire thickness of the shaft have perished by necrosis. A considerable quantity of new bone has produced an osseous ankylosis between the radius and ulna and between the olecranon and the lower part of the humerus. There is also a mass of bone, not unlike a detached coronoid process of the ulna, united with the front of the trochlea of the humerus on the one hand, and with the neck of the radius on the other.

Removed by amputation from a man 24 years of age, of scrofulous appearance.

Presented by Sir Stephen L. Hammick.

1836. The bones of a right elbow-joint, the articular surfaces of which have been partially removed by ulceration. A thin layer of rough new bone has also been formed on some parts of their surface, such as, if continued, would probably have led to osseous ankylosis. This is most marked in the

humero-ulnar portion of the joint. Some new bone has been formed upon the neighbouring surfaces of the shafts of the bones, especially on the line leading from the outer condyle of the humerus.

The disease arose from a heavy blow on the joint, received in falling from a great height, without, however, wounding the integuments. Severe inflammation set-in, attended by intense pain and constitutional disturbance. At the patient's urgent request, the limb was amputated, and he rapidly recovered.

Presented by Sir Stephen L. Hammick.

1837. A radius and an ulna, of which the upper articular surfaces are superficially ulcerated. New bone is formed on the upper part of their shafts. *Hunterian.*

1838. The lower end of a humerus, the articular surface of which is similarly ulcerated. *Hunterian.*

1839. Similar specimens, in which the ulceration has proceeded to a greater extent, making deep cavities in the articular surfaces and destroying the borders of all the bones of an elbow-joint. *Hunterian.*

1840. An ulna, the superior articular surface of which is uneven, hard and somewhat tuberculated, as if healed after being ulcerated. *Hunterian.*

1841. The upper part of an ulna, of which the articular surface is destroyed by ulceration. The parts adjacent to it are smoothly covered with new bone ; and parts of the ulcerated surface are hardened. *Hunterian.*

1842. A radius, probably from the same arm as the preceding specimen. Its upper extremity is reduced to a size less than that of its shaft, and is turned obliquely backwards, but bears no marks of recent ulceration. *Hunterian.*

1843. A radius, of which the lower articular surface is nearly all removed by superficial ulceration. New bone is abundantly formed on the adjacent part of the shaft. *Hunterian.*

Ulceration of the Articular parts of Bones of the Lower Extremity, excluding those of the Hip-joint : 1844 *to* 1856.

1844. The lower end of a femur, of which the condyles are deeply and irregularly ulcerated. The inner condyle is much altered in shape by new bone formed around part of its inner border, and by the flattening and hardening of that portion of its ulcerated surface which, it is probable, rested upon the tibia. *Hunterian.*

1845. The lower end of a femur, in which the whole surface of the condyles is ulcerated. There is also a deep ulcerated cavity in the internal condyle. The lower and posterior part of the outer condyle has, after ulceration, been expanded and hardened on its surface. *Hunterian.*

1846. The corresponding ends of a femur and tibia, in which nearly the whole of both articular surfaces is ulcerated. There are, besides, a deep ulcerated cavity in the posterior part of the outer condyle of the femur, and one larger and deeper in the outer part of the head of the tibia, in which the margin of the outer condyle rested, the knee being bent far inwards. The surface of the lower and posterior part of the inner condyle of the femur appears not to have been ulcerated, but is covered with a hard polished layer of bone; and there is a small portion of a similar tissue on the corresponding inner part of the head of the tibia. *Hunterian.*

1847. The corresponding ends of a femur and tibia, in which nearly the whole of both articular surfaces is ulcerated. There is a deep ulcerated cavity in the outer part of the head of the tibia, into which is adapted a growth of bone from the

lower surface of the outer condyle of the femur. New bone has been abundantly formed on the parts adjacent to the articular surfaces. *Hunterian.*

1848. A patella, the whole articular surface of which has been evenly removed by ulceration. *Hunterian.*

1849. The upper part of a tibia, of which the articular surfaces have been evenly removed by ulceration. The surface of bone exposed by the ulceration appears, as it does also in many preceding specimens, to be quite healthy. *Hunterian.*

1850. The upper part of a tibia, in the articular end of which there are several deep ulcerated cavities. The whole articular surface is destroyed. *Hunterian.*

1851. The lower part of a tibia, in which all the articular surface has been evenly ulcerated. The internal malleolus has been removed by fracture or by ulceration. *Hunterian.*

1852. The upper part of a fibula, in which the articular surface is ulcerated, and new bone abundantly formed on the part adjacent to it. *Hunterian.*

1853. A fibula, in which the lower articular surface is ulcerated. New bone is formed on the whole surface of the shaft. *Hunterian.*

1854. The lower halves of a tibia and fibula, united by a large quantity of new bone accumulated around their articular extremities. Their articular surfaces are enlarged, superficially ulcerated and, over a small extent, hardened, grooved and polished. There is a deep osseous channel where the tendons of the flexor muscles passed behind the internal malleolus.

1855. An astragalus, in which part of the surface of its posterior articulation with the os calcis is superficially ulcerated.

Hunterian.

1856. An astragalus and part of the os calcis, showing ulceration of the anterior articular surfaces for the scaphoid and cuboid, and also of the articular surface between the head of the astragalus and the os calcis.

From a man whose foot was amputated on board the 'Dreadnought' by Pirogoff's operation. The specimen shows the amount of the os calcis which was removed.

Presented by George Busk, Esq., 1870.

Suppurative and Ulcerative Diseases of the Hip-Joint.
(*Morbus Coxarius: Coxalgia.*)

1857. The hip-joint of a child. The cartilage of the head of the femur, in a wide extent, has been separated from the bone after ulceration of thin layers of their contiguous surfaces. The ulceration of the bone has also extended irregularly down the inner part of the neck to below the lesser trochanter; the whole of this space is rough and covered with lymph or tuberculous matter. The round ligament has been destroyed; and large portions of cartilage have been removed from the acetabulum, leaving the rest with abrupt ulcerated margins, but closely connected with the subjacent bone. A portion of the capsule remains and is covered with lymph.

From the Museum of Sir A. P. Cooper.

1858. The bones of the left hip-joint, and upper part of the right femur, from a child. In the hip-joint the ligamentum teres, as well as some of the cartilage of the acetabulum, has been destroyed by ulceration; but the head of the femur is comparatively little affected. The edge of the remaining portion of the cartilage of the acetabulum is thin, uneven and transparent. On the right femur the articular cartilage is almost all removed. *Presented by John Hilton, Esq.*, 1867.

1859. The right hip-joint of a child. Nearly all the cartilage has been removed from the head of the femur, and the free surface of what remains is made irregular by ulceration. The exposed surface of the bone is covered with lymph and granulations; and its head and neck appear somewhat reduced in size. The acetabulum is increased in width and flattened; all its articular cartilage is removed, and its place is filled with lymph and granulations. The whole of the cartilage between the ilium and the ischium, and the ischium and os pubis, has also been removed by ulceration. The round ligament is destroyed; and what remains of the capsule is shortened, thickened, and lined with lymph.

Hunterian.

1860. The hip-joint of a child, in which the round ligament appears to have ulcerated through its middle; its remains retain their natural attachments. A considerable quantity of lymph is deposited in the acetabulum; and a large ulcerated aperture extends through the lower and inner part of the capsule. The bones and cartilages appear healthy.

From the Museum of George Langstaff, Esq.

1861. The hip-joint of a young person. All the articular cartilage has been removed from the head of the femur, except that around its base, part of which remains irregular, partially detached, and perforated by many round apertures. The subjacent bone is also ulcerated, so that the head is flattened and much diminished in size. The round ligament remains attached to the head of the femur, but is separated from the acetabulum, and hangs loose and flocculent. All the cartilage is removed from the acetabulum; and its cavity, somewhat increased in depth, is nearly filled with lymph. The capsular ligament is thickened. A part of it is preserved, through which two small ulcerated apertures (marked by portions of whalebone), one in front of the trochanter, the other below it, lead to fistulous canals through the inte-

guments. There is also an ulcerated passage leading from the acetabulum through the substance of the iliac portion of its border.

The disease was of long standing; and the limb was much shortened, though the head of the femur remained in the acetabulum.

From the Museum of Robert Liston, Esq.

1862. A hip-joint, in which the head of the femur, deprived of all but the outer border of its articular cartilage, superficially ulcerated, and covered with a thin layer of lymph, was dislocated nearly straight upwards. The posterior part of the neck, which rested on the edge of the acetabulum, is flattened and depressed; and all the fibrous tissue around the neck is thickened. New bone has been formed on the upper border of the acetabulum, and there is a very capacious capsule of tough fibrous tissue around the head and neck of the femur. A small aperture through the bottom of the acetabulum is filled with soft substance. *Hunterian.*

1863. A child's hip-joint, in which a great part of the floor of the acetabulum has been destroyed by ulceration, and the cavity of the joint opens into the pelvis by an irregular aperture about an inch in diameter. Nearly all the head of the femur, also, has been removed by ulceration: its remains protrude through the aperture into the pelvis. The capsule of the joint is thickened and contracted.

The disease was two years in progress.

From the Museum of Sir A. P. Cooper.

1864. A hip-joint, from an adult, in which the head and a part of the neck of the femur have been destroyed by ulceration. There has also been extensive ulceration of the acetabulum, through the walls of which are two fistulous passages, indicated by portions of whalebone. One of these passages extended obliquely through the bottom of the acetabulum,

and in front of the spine of the ischium, to the rectum, into which it opened by a large orifice.

The patient was a boy 14 years old. The disease of the hip-joint was of long standing; and air used to pass with a quantity of fœtid thin discharge from a fistulous opening in the back of the thigh.

From the Museum of Robert Liston, Esq.

1865. The lower part of the rectum mentioned in the preceding description, in the walls of which, two inches from the anus, is an aperture one third of an inch in diameter. It leads to a short fistulous passage in the thickened coats of the intestine, through which the communication was formed with the interior of the diseased hip-joint.

From the Museum of Robert Liston, Esq.

1866. A vertical section of the bones of a hip-joint. The articular cartilages are removed, and the subjacent bone is rendered rough and uneven by superficial ulceration. The denuded surfaces of bone are in contact but have not coalesced; a thin layer of soft tissue intervenes between them. New bone has been formed around the base of the head of the femur: its interior appears healthy except that, near the base of the great trochanter, there is a small, smoothly walled cavity in the midst of the cancellous tissue, which was probably filled with medulla.

From the Museum of George Langstaff, Esq.

1867. The other section of the same femur, macerated and dried.

From the Museum of George Langstaff, Esq.

1868. A section of a hip-joint, showing close, fibrous ankylosis between the femur and acetabulum. The head of the femur is very irregular; and on the front of the neck is a cavity with smooth walls, whence a portion of bone exfoliated many years before the patient's death.

From a girl who died of phthisis when 22 years of age. She showed signs of old hip-joint disease, and a sinus remained near the great trochanter. The spleen and kidneys had undergone lardaceous changes; and the lungs were extremely tuberculous.

Presented by Dr. Goodhart, 1873.

1869. A vertical section through a right acetabulum, with the head, neck, and upper part of the shaft of a femur. The epiphysis of the head is partially separated from the neck of the femur, which is slightly displaced from it to the inner side. The epiphysis and neck are firmly united by fibro-cartilaginous tissue partially ossified; the greater part of the articular surface of the head is united to the acetabulum by well-formed bone, the remaining part by fibrous tissue; new bone is thinly formed on the outer portion of the acetabulum.

From a woman, aged 22. About six months before death she was taken ill, without any known cause, with pains down the right leg and thigh, which confined her to bed. She felt great pain in the hip and inability to move the limb. Two months later, soon after falling asleep, the thigh became somewhat suddenly bent and the foot inverted: and from that time she was unable to straighten the limb. On admission into hospital, two months later, the position of the right lower extremity corresponded exactly with that usually observed when the head of the thigh-bone is dislocated on the dorsum of the ilium. "On forcibly inverting the right leg," writes Mr. Hilton, "the head of the thigh-bone could be distinctly felt under the muscles upon the dorsum of the ilium;" but a doubt is expressed "whether it was not the projecting portion formed by the neck of the bone which I felt upon the dorsum of the ilium previous to the reduction of the dislocation." The displacement was reduced, and the limb placed in position by a long splint. The patient for the first few weeks improved rapidly in health; but an old bedsore over the sacrum extended to the spinal canal, causing death from pyæmia forty-four days after the reduction of the dislocation. It is most probable that the head had always remained in the acetabulum, the neck, detached from it, having alone become dislocated. (See Hilton on 'Rest and Pain,' 2nd ed., p. 338.)

Presented by John Hilton, Esq., 1862.

1870. The other half of the bones of the same hip-joint, macerated and dried. *Presented by John Hilton, Esq.*, 1867.

1871. The bones of a hip-joint. The head of the femur has been almost entirely removed by ulceration, and only a small portion of its lower border remains; its exposed surface presents a healthy cancellous tissue. There are traces of superficial ulceration of the neck; and new bone has been deposited about the attachment of the capsular ligament and along the linea aspera. The acetabulum is extensively ulcerated; all its margin is destroyed; and at its floor a wide irregular opening into the pelvis nearly separates the pubic and ischiatic portions from the iliac portion of the os innominatum. The tissue of all the bones is light, dry, and spongy.

The patient was 25 years old. Eighteen months before his death, having for some time previously had pain in the hip-joint, he received a kick from a horse behind the great trochanter. The accident was followed by exceeding pain and tenderness in the groin, with shortening and eversion of the limb. An extensive abscess formed on the inner side of the thigh, under the exhausting discharge from which the patient died.

From the Museum of Robert Liston, Esq.

1872. The bones of a hip-joint. There is a large ulcerated aperture through the bottom of the acetabulum; and its edges, though irregular, are smoothly rounded, as if it had long existed and been partially healed. The rest of the surface of the acetabulum is unevenly ulcerated; and its cavity is much increased in depth by an irregular accumulation of bone upon its upper and posterior margin. The whole of the ilium is thickened; and new bone is deposited abundantly upon its crest. The head of the femur is reduced in size and flattened by ulceration, so that it is less than half an inch in depth. Its surface is nodulated and projected a little through the upper and posterior part of the hole in the acetabulum. The neck of the femur is shortened; and, the shaft having been drawn upwards and backwards, with extreme flexion of the thigh upon the trunk, the upper part of the base of the neck was in contact with the new bone formed on the border of the acetabulum, and has had a corresponding portion of new bone formed on its own

surface, so as to produce a kind of false joint. A similar but smaller deposit of new bone has taken place on the inferior part of the neck close by the trochanter minor, and presents a rough but nearly level articular surface. Upon this surface rested a portion of the head of the femur, detached after necrosis or ulceration ; it is an inch and a half in diameter and about half an inch thick, and includes the place of attachment of the round ligament. Part of the original articular surface of this portion of the femur is ulcerated ; but the remainder, which appears to have rested in a depression on the front and outer part of the os pubis, is healthy. Part of the surface at which the loose portion of the femur was detached is smooth, in correspondence with the surface already described on the lower part of the neck.

The patient was an old man, who died soon after receiving a fracture high up in the shaft of this femur. The disease of the joint was of long standing.

From the Museum of Robert Liston, Esq.

1873. The bones of a hip-joint. The acetabulum appears flatter than usual, on account of the destruction of its edges, and it is perforated by ulceration. The femur is dislocated upwards ; its head, partly destroyed by ulceration, lies on the dorsum of the ilium immediately above the sciatic notch, where a high ridge of bone serves to keep it in position. There is no osseous ankylosis between the bones.

From a boy, aged 14, in whom hip-disease had existed for many years. The affected leg was adducted and shortened. He died of lardaceous disease of internal organs. See Trans. Path. Soc. vol. xxxi. p. 248.

Presented by Dr. Lediard, 1880.

1874. The bones of a hip-joint. The acetabulum is not so shallow as that in the preceding specimen ; but its deepest part is more extensively perforated by ulceration, and the ilium in its vicinity is roughened by the formation of new bone. The head of the femur, partly destroyed by ulceration, is dislocated onto the upper border of the acetabulum ;

and there is a considerable formation of new bone around it on the dorsum of the ilium.

From a youth, aged 19, who had suffered for several years from hip-disease and necrosis of bones in other parts, the disease having followed what was regarded as rheumatic fever. He died of lardaceous disease of internal organs. See Trans. Path. Soc. vol. xxxi. p. 247.

Presented by Dr. Lediard, 1880.

1874 A. An innominate bone from an imbecile girl aged 15 years, who had long suffered from hip-joint disease. All trace of the margins of the acetabulum is lost; and the ilium is extensively destroyed; an elongated carious cavity extends upwards from the acetabulum towards the anterior superior spine. The lower portion of the floor of the acetabulum is completely destroyed.

Accompanying Dr. Alexander's Jacksonian Prize Essay, 1882. *Case* 70.

1875. A pelvis and femora. The right acetabulum is somewhat increased in depth by the growing-up of its inner wall. The head of the right femur appears to have been superficially ulcerated; and its surface is rough, in part cancellous and in part covered with a layer of new bone. The neck of this femur also is shortened an inch and a quarter; and new bone is irregularly formed about its junction with the head and at the anterior line of attachment of the capsular ligament. The left side of the pelvis and the left femur are healthy.

It is probable that these changes were consequences of injury.

From the Museum of Robert Liston, Esq.

1876. The bones of a left hip-joint. There has been superficial ulceration of the head of the femur and of the acetabulum, the exposed surfaces of which are for the most part smooth and like those of healthy cancellous tissue. New bone has been formed around the acetabulum and upon the inner surface of the ilium and os pubis, in the course of the iliac muscle, beneath which there was also superficial ulceration. The bones are light and brittle. *Hunterian.*

1877. The bones of a right hip-joint. The head of the femur is, as in the last specimen, superficially and evenly ulcerated. The acetabulum also is similarly ulcerated over nearly all its surface; and its walls are perforated by several large apertures which open into the pelvis and iliac fossa. Part of the inner surface of the ilium, also, is ulcerated. New bone is thinly deposited around all the ulcerated parts.

Hunterian.

1878. A right os innominatum and upper part of the corresponding femur. The articular surface of the acetabulum is almost entirely removed by ulceration; but a piece near the outer border, three quarters of an inch long and of about half that width, is necrotic. The surface for articulation with the sacrum appears also to have been the seat of ulceration, and has several deep cavities excavated in it. Nearly the whole of the ilium bears evidence of inflammatory change, in its increased vascularity and the formation of new bone upon both inner and outer surfaces. The entire head of the femur and part of the neck is superficially ulcerated, leaving the cancellous tissue exposed and apparently healthy. *Presented by Sir Stephen L. Hammick.*

1879. A sacrum, os innominatum, and upper part of a right femur, from a case in which disease of the hip-joint appears to have been complicated with psoas-abscess. The inner surface of the posterior part of the ilium is superficially ulcerated. Part of the anterior half of the sacro-iliac symphysis is ossified. The acetabulum is much enlarged by the deep ulceration of its borders and base, and a large portion of its upper and inner wall is wholly removed. The upper half of the head of the femur has been destroyed by ulceration; the exposed surface, like that of the ulcerated acetabulum, appears to be formed of healthy cancellous tissue. New bone has been formed around all the ulcerated parts. All the bones are light and fragile. *Hunterian.*

1880. A pelvis, with the upper parts of the thigh-bones, of a girl about 16 years old. Nearly the whole of the left acetabulum

has been destroyed by ulceration. Nothing remains of the left ischium but a separate shapeless ulcerated piece of bone, with a trace of the surface of its tuberosity. The ilium, for a considerable distance above the acetabulum, is deeply and irregularly ulcerated and covered with new bone. The os pubis is superficially ulcerated at its outer extremity: but, while the acetabulum, in which it is probable that the disease commenced (perhaps in the tissue connecting the several portions of the os innominatum), is thus extensively destroyed, the head and neck of the femur are only superficially ulcerated. The right side of the pelvis is healthy, except in being, like all the other bones, very light and brittle; but there is superficial ulceration of the trochanters of the right femur and of the upper part of the left femur, with the production of some new bone, the consequence, probably, of pressure in the recumbent position of the body. *Presented by Robert Keate, Esq.*

1881. The bones of a hip-joint, with part of the sacrum. The head of the femur is almost wholly removed by ulceration: a low conical projection of apparently healthy cancellous tissue is all that remains surmounting the neck. There are also traces of superficial ulceration, and of small formations of bone, upon the neck and shaft of the femur. The acetabulum is reduced in depth, but much increased in width, by the ulceration of its borders; at its centre there is a small aperture into the pelvis and, above it, a flat smooth surface upon the anterior and lower part of the ilium, on which the head of the femur rested after dislocation. In front of this surface also there are two small ulcerated apertures through the anterior inferior spine of the ilium; and all round it new bone has been deposited. At the sacro-iliac symphysis the surfaces of both bones are superficially ulcerated; and opposite the middle of the articulation there is a large oval aperture through the ilium. All the bones are light and spongy.

From a man between 20 and 30 years old, who died hectic with extensive abscesses about the hip and in the iliac fossa.

From the Museum of Robert Liston, Esq.

1882. The bones of a left hip-joint. The borders of the acetabulum, especially the anterior and superior border, have been destroyed by ulceration ; its base also is nearly all ulcerated, and at the middle there is a large aperture into the pelvis. Hard and heavy new bone has been formed upon the adjacent parts of the os innominatum. The head of the femur is small and conical : its surface is uneven but hard and, anteriorly, is perforated by many small round apertures, like worm-eaten wood. Its base is enlarged by the accumulation of hard and heavy new bone around it; and upon the neck and at its lower margin there is a short broad prominence of new bone, which appears to have fitted-in beneath the notch of the acetabulum, and thus to have aided in the support of the pelvis. Both the bones, where they are not ulcerated, are strong and heavy, indicating that the disease of the joint was at least partly recovered from. *Hunterian.*

1883. The bones of a left hip joint. The head of the femur is deeply and unevenly ulcerated : its exposed surface is, for the most part, hard and nodulated ; and new bone has been formed around its base, especially at the anterior part. A large quantity of new bone has also been formed below the trochanter minor ; and the whole shaft is hard and heavy. The acetabulum has been ulcerated, but not deeply nor at its borders; and new bone has been formed at its base. The nodulated surfaces of the acetabulum and of the anterior part of the head of the femur appear to have been closely adapted, in such a position that the limb must have been very much inverted ; and in this position it is probable that the projections of new bone below the trochanter minor, and a similar one on the upper and outer part of the os pubis, served for the attachment of muscles that were stretched and, perhaps, ligamentous. *Hunterian.*

1884. The bones of a left hip-joint. A large irregular ulcerated aperture extends through the bottom of the acetabulum, around the border of which, on the inner side, some hard

new bone is formed. The rest of the cavity is much reduced in size and altered in shape, by the formation of bone on its surface and thickening its walls. The surface of this new bone is for the most part smooth, though irregular, and at its upper part is for a small extent hardened and polished. New bone is also irregularly deposited around the acetabulum on its outer surface. The greater part of the head of the femur has been removed by ulceration. The base, which alone remains, is altered in form but not enlarged, and its surface is for the most part hard, polished and perforated, in correspondence with the polished portion of the surface of the acetabulum, on which it had a limited motion. At the lower border of this remaining part of the head a process has grown out, which passed into the aperture through the bottom of the acetabulum. The general texture of both bones appears healthy; and they are of ordinary size and weight.

1885. The bones of a hip-joint. The cavity of the acetabulum is nearly filled up with cancellous bone, firmly fixed to its margins, but leaving, at the bottom, a cavity which communicates with the pelvis by several small apertures through its attenuated inner wall. On the outer wall of the ilium, above and behind the acetabulum, there is an accumulation of bone, nearly an inch in depth, and presenting a slightly concave oval surface, three inches in length, composed of hard cancellous tissue. There is a similar heaping-up of bone, but of less extent, above and in front of the acetabulum. Nearly the whole of the head of the femur has been removed; the remains of it present a smooth and slightly convex cancellous surface, which is continuous with that of a large mass of new bone deposited upon and below the trochanter minor. The two surfaces together are of nearly the same size as that of the bone formed above and behind the acetabulum, on which they fitted but were probably immovable. There is a considerable deposit of new bone on the posterior part of the neck of the femur, and on other parts adjacent to the hip-joint. The remains of both the bones are strong, and of full size and weight.

From a person of middle age, whose limb had for a long time been much shortened.

From the Museum of Robert Liston, Esq.

1886. The bones of a hip-joint. The acetabulum is removed to a greater than the natural distance from the foramen ovale, and is reduced to a broad shallow depression, by the ulceration of its margins and the thickening of its inner wall; but its surface is smooth and compact, and the bones around it appear healthy, though very small. The head of the femur is reduced to a small disk-shaped body, little more than an inch in diameter, which is set on a short pedicle between the trochanters. The articular surface of this remaining part of the head is smooth, but perforated by many apertures, and in one situation polished; its tissue appears sound, but light and dry. The surface of the lesser trochanter is flattened; for it rested on the posterior margin of the notch of the acetabulum, the limb (though probably movable) appearing to have been habitually in a position of extreme flexion. *Presented by William Long, Esq.*

1887. An os innominatum and a femur. The head of the femur, much reduced in size and altered in its form, was dislocated upon the dorsum of the ilium, on which its flattened inferior and internal surface rested on a shallow concave surface, about an inch above and behind the acetabulum. The two surfaces of bone are simply adapted to each other: neither of them is changed in texture by friction, nor is any new bone formed around them. The axis of the shaft of the femur was directed almost horizontally forwards and inwards; and the lesser trochanter rested on a small, hard, and slightly elevated surface of bone at the posterior border of the acetabulum. The acetabulum is reduced to a small shallow triangular cavity, the reduction of size being the consequence chiefly of the thickening of its posterior wall. All the bones are thin and light; but they are hard, and there is no appearance of the disease having been in progress at the time of death.

From the Museum of Joshua Brookes, Esq.

1888. A similar specimen, with the head of the femur more reduced in size.

Presented by Gilbert W. Macmurdo, Esq., 1867.

1888 A. An innominate bone with the acetabulum obliterated and partly filled-up with new bone, which is perforated by two channels leading to an excavated carious surface on the inner aspect. The acetabular portion of the bone appears to have been slightly bulged outwards, as if by the pressure of the abdominal viscera.

From a patient whose lower extremity was amputated at the hip-joint one year before death.

Accompanying Dr. Alexander's Jacksonian Prize Essay, 1882. *Case V.*

1889. The bones of the left hip-joint of a young person. The head and a part of the neck of the femur have been destroyed by deep and irregular ulceration ; their surface now exposed is in part cancellous and in part hard and nodulated. The acetabulum has been similarly ulcerated, and is enlarged ; it is perforated through its inner and posterior walls ; and its cavity is nearly filled with bone whose texture is hard and cancellous, and which is firmly attached to its inner wall. There has been remarkable atrophy of the ischium and os pubis. The rough surface of the head of the femur appears to have been closely adapted to that of the bone in the acetabulum, but is not united to it. *Hunterian.*

1890. An os innominatum and a right femur, closely united by bone at the hip-joint. The head of the femur and part of its neck were destroyed by irregular ulceration ; and their remains were drawn forwards and upwards to the anterior part of the acetabulum, with which they are united, both by the coalescence of their own tissues and by portions of new bone attaching their adjacent external surfaces. The shaft of the femur is directed almost horizontally forwards and inwards. *Hunterian.*

1891. The bones of a hip-joint. The head and part of the neck of the femur are removed by ulceration ; and the remaining surface of the neck is firmly united by bone to the upper part of the acetabulum. The acetabulum is much reduced in depth ; and new bone has been formed on many parts adjacent to it. The tissue of the bones is strong and heavy ; but they are reduced in size.

From the Museum of Robert Liston, Esq.

1892. An os innominatum and a femur, closely and smoothly united by bone at the hip-joint. The femur is directed almost straight forwards ; but the form of that part of it which is not enclosed in the acetabulum is little altered. The border of the acetabulum has grown out over the base of the head of the femur ; but its notch is preserved, a plate of bone united to the femur replacing that portion of the cotyloid ligament which extends across the notch. A section through the ilium and the head and neck of the femur shows that the substance of the acetabulum and that of the head of the femur have so completely coalesced, that their original outlines can be nowhere traced. *Hunterian.*

1892 A. A section of a hip-joint, the articular surfaces of which are closely united by fibrous tissue. In the recent state the cartilages were seen to be eroded at intervals ; and in places the bones were excavated.

From an adult who suffered from disease of the hip-joint and of the tarsus in his youth.

Accompanying Dr. Alexander's Jacksonian Prize Essay, 1882.

1893. Part of an os innominatum. The acetabulum is reduced in depth, and its circumference is diminished, by a great accumulation of new bone upon and by the sides of its posterior border. The surface of the new bone is slightly concave ; and part of it, on which probably the dislocated head of the femur rested, is smooth. The adjacent bone is healthy. *Presented by Sir William Blizard.*

1894. The upper part of a right femur, the head of which is diminished in size, flattened, and in parts ulcerated. Its whole texture is very light and dry. *Hunterian.*

1895. A similar specimen. *Hunterian.*

1896. A similar specimen, except that the base of the head of the femur is enlarged by the accumulation of bone around its border, and that the flattened articular surface which in the preceding specimens is nearly covered with a thin layer of compact bone, is in this superficially ulcerated.

Hunterian.

1897. The upper part of a right femur, of which, in disease of the hip-joint, the whole of the head has been destroyed, and the greater part of the neck reduced to less than an inch in thickness. The surface of the neck is healthy; but there is a deep ulcerated cavity in the front and upper part of the great trochanter. *Hunterian.*

1897 A. Sections of the head and neck of the femur from a case of hip-joint disease in an adult. The medullary canal is much enlarged by eccentric atrophy of the bone; and the cancellous tissue of the head has also been removed, leaving a large cavity, the wall of which is formed by the articular lamina of the head. The bone appeared to be in a condition of fatty degeneration. The neck of the femur is very short and narrow, and has yielded so that the position of the head is much lower than natural.

Accompanying Dr. Alexander's Jacksonian Prize Essay, 1882. *See* p. 50.

Fibrous Degeneration of Articular Cartilage, Eburnation of Bone, and other changes in Osteo-Arthritis (Chronic Rheumatic Arthritis).

1898. "The patella of a man who died after having bruised his knee."—*Hunterian MS. Catalogue.*

The central portion of the articular cartilage appears irregularly fissured in several directions: all the apparent fissures pass through its substance in planes perpendicular to the surface of the bone. It is probably an example of the beginning of the fibrous degeneration of cartilage, though, except in the appearance of being fissured, the texture of the cartilage is not altered. *Hunterian.*

1899. A patella, on which the same disease has proceeded to a further degree. A great part of the cartilage, after being resolved into fibres, has been wholly removed. The surface of the exposed bone is hard and smooth, in some parts polished, in some slightly nodulated. The remaining cartilage, immediately around the margin of the exposed bone, is, for the most part, changed into long, close-set, loosely hanging fibres; and that which is more distant and nearer the outer border of the patella is cracked and, as it were, breaking-up in various directions. The margin of the patella is beset with large flattened nodules of new bone.

Presented by Sir Everard Home.

1900. The head of a femur, on which the free surface of the cartilage, covering a space half an inch in diameter about the attachment of the round ligament, is shreddy and flocculent, having undergone, probably, the same change as is shown affecting the whole substance of the cartilage in the preceding specimens. Nearly the whole of the round ligament has been removed.

From a man 25 years old.

Presented by Joseph Swan, Esq.

1901. Section of the upper part of a femur, from the middle of the head of which a large portion of the articular cartilage has been removed. The bone thus exposed is unnaturally hard; its surface is polished like ivory; and the morbid hardness extends for about a line in depth. Of the remaining cartilage, some is softened, thick, succulent and, on its surface, nodulated, while that round the margin of the exposed bone is very thin; other parts are marked with grooves, like wrinkles, radiating to the outer margin of the head; and others are converted into fibrous tissue, long shreds of which hang from the surface of the bone. New bone, in hard irregular nodules, is formed round the margin of the head, and on the neck, of the femur.

The patient, a man 42 years old, had rheumatic pains of the hip during the last four years of his life. He died with cancerous disease of the ilium. The other section of the femur is in the Museum of St. Bartholomew's Hospital.

Presented by Edward Stanley, Esq.

1902. A knee-joint, in which the cartilages on the femur and patella have undergone changes like those last described. In some situations they are wholly removed, leaving the subjacent bone smooth and hard; in others they are fissured and fibrous; and in the rest of their extent they are very thin. The synovial membrane around the borders of the cartilages is beset with groups of long, narrow, leaf-like processes of fat covered with a continuation of the membrane, some regularly formed, some shreddy, some branched. The cavity of the joint appears to have been much distended; at its upper part the synovial membrane is covered with thin films of false membrane; and near its outer boundary a slender fibrous band passes from one wall to the other.

Eleven or twelve years before death there had been copious effusion into the joint.

From the Museum of John Howship, Esq.

1903. The lower part of a right femur and upper portion of the

tibia, with the head of the fibula, from a case of osteo-arthritis. The cartilages of the knee-joint are in great part removed, and the articular surfaces of the bones much grooved by ulceration, but not eburnated, nor having any bony outgrowths along their edges. Below and behind the patella and at the sides of the joint are masses of enlarged synovial fringes.

From a man aged 61, who died from exhaustion with extreme arthritis, after having lived eight years in a workhouse-infirmary. During the last four months of his life he was unable to stand, and during the last two he could not feed himself. The right hand had become deformed, the fingers being bent to the ulnar side and the palm contracted; no other joints were materially distorted, though many crepitated when moved. On *post-mortem* examination nearly all the joints were found to have lost their cartilages. The absorption seemed to have commenced at the circumference of the articular surfaces. There was no distortion of the articular ends of bones, with bony outgrowths, usually seen in osteo-arthritis. The synovial membranes were very vascular; the tendons of muscles and ligaments of joints had become in many places adherent to the articular capsules. The hip-, ankle-, and calcaneo-astragaloid joints were the least affected. For other bones from the same case see No. 2048. A complete history of the case will be found in the Trans. Path. Soc. vol. xxiii. p. 194.

Presented by Jonathan Hutchinson, Esq., 1872.

1904. The knee-joint of a man 64 years old, who had for many years suffered from what was regarded as gout. The articular cartilages have been removed, and the borders and parts of the articular surfaces of the femur and tibia are thickly beset with nodules of hard new bone, of various size and shape, covered with thin layers of fibrous tissue. Among these, also, are numerous small pedunculated growths, leaf-like, and enlarged at their free extremities; and similar growths, most of which are not more than two or three lines in length, are attached, singly and in groups, to nearly all the internal surface of the synovial membrane. The synovial membrane is distended and thickened, and flakes of recently formed lymph are adherent to some parts of it.

The joint was greatly distended with lymph, coagulated blood,

and an oil-like fluid. The other knee-joint and the wrist-joints were similarly diseased, but to a less extent.

From the Museum of George Langstaff, Esq.

1905. The right knee-joint of a woman aged 77. The form of the condyles of the femur is much altered by nodulated growths; the cartilage is in great part destroyed; the bone is covered with nodular outgrowths, some flattened and sessile, others pedunculated; some over half an inch in length. The head of the tibia shows similar changes; and its articular surface is deeply hollowed by friction against the posterior parts of the condyles.

The history of the case is unknown. The right shoulder-joint is No. 1989.

From a Dissection-subject, 1865.

1906. An astragalus, from a "gouty" person. Its articular cartilages are in some parts thin; in others small portions of their borders appear to have been removed by chronic ulceration. *Hunterian.*

1907. The os calcis of the same foot, similarly diseased.

Hunterian.

1908. The bones of a right hip-joint. The acetabulum is much increased in depth by an accumulation of new bone upon the whole of its border, and especially upon its lower part, where a kind of ridge, shallow and grooved, is formed, and served as a support for the base of the head of the femur. A portion of the cotyloid ligament which is preserved shows that this accumulation of bone has taken place external to it, not in its substance. Part of the articular cartilage of the acetabulum has been removed; that covering its upper third remains, and appears healthy. The exposed surface of the rest of the bone is hard, in most parts compact, in some polished, but in all parts perforated by numerous minute round apertures, which make it look like worm-

eaten wood. Bone deposited on each side of the groove over which the tendon of the psoas muscle passed formed a deep channel for it. New bone is also formed in the situation of the ligaments closing-in the notch of the acetabulum. The head of the femur is flattened and conical, as if a portion of its upper surface had been removed; its base is greatly enlarged by an accumulation of new bone around it, especially at the lower and back part, where a ridge is formed corresponding with that already described as projecting from the lower border of the acetabulum. The articular cartilage remains on the part of the head which corresponded with that portion of the acetabulum on which also the cartilage remains; the rest of the surface of the head is hard, and in part polished, but perforated with numerous minute holes.

From the Museum of Robert Liston, Esq.

1909. Part of an os innominatum, in which the acetabulum is almost exactly like that in the specimen last described.

Hunterian.

1910. The half of a pelvis, with the upper part of the corresponding femur. The cavity of the acetabulum is nearly filled-up by a mass of nodulated hard bone, which appears to have grown from its base. In the upper and posterior part the surface of this new bone is very compact, polished, and perforated; and there is a similar polished surface of small extent on a large mass of new bone fixed to the lower part of the acetabulum. On these surfaces the head of the femur was in contact with the acetabulum. The head of the femur is much altered in form; its base is enlarged, and its diameter, from above downwards, is nearly twice as great as is usual, so that in profile it is nearly elliptical. At the posterior part of the head, near its base, is an oval, polished, and perforated surface, corresponding with that on the upper part of the acetabulum on which it moved. The rest of the surface of the head, comprising two thirds of the whole, was entirely outside the acetabulum, and looked

straight forwards, so that the foot must have been extremely everted. This part of the head is rough, in some parts soft and granulated, in others ulcerated and broken. On the posterior part of the neck of the femur, and of the lesser trochanter, there is a circumscribed elevated growth of new bone, nodulated at its borders, and polished on a part of its convex surface, which corresponded with and moved upon the polished surface of the bone filling up the lower part of the acetabulum.

From the Museum of Joshua Brookes, Esq.

1911. A femur in which, after the removal of the articular cartilage (probably in chronic rheumatism), a large portion of the head acquired a hard, polished, and finely perforated surface. There is a rough elevation of bone in the place of the usual depression for the ligamentum teres ; and a large quantity of new bone has been formed upon the neck of the femur, especially upon its anterior and inferior surfaces. There is an appearance of a well-united fracture just below the middle of the shaft; and a broad spiculum extends horizontally from this part of the bone.

1912. A scapula and clavicle, the corresponding articular surfaces of which are enlarged, rough, and perforated with numerous small round apertures. A border of new bone is formed in hard nodules around the margins of the joint, and aronnd the border of the glenoid cavity. *Hunterian.*

1913. The opposite clavicle of the same person, similarly and symmetrically diseased at its scapular extremity.

Hunterian.

1914. A right humerus, radius and ulna. The elbow-joint is extensively occupied by much irregular new bone, especially upon the articular surface of the ulna. The coronoid process appears to be affected more than the olecranon ; a flat,

concave shell of bone is formed on the back part of the lesser sigmoid cavity.

Presented by Gilbert W. Mackmurdo, Esq., 1867.

1915. The lower end of a femur, and a patella. Part of the outer condyle of the femur, after the removal of its cartilage, has acquired a hard, porcelain-like, polished and vertically grooved surface. There is a corresponding surface on the patella; and the borders of the articular portions of both bones are surrounded with thin nodulated ridges of hard new bone, which were accurately adapted to each other. A considerable formation of new bone has also taken place on the back of the shaft of the femur.

From the Museum of John Heaviside, Esq.

1916. The bones of a left knee-joint. A very wide formation of solid new bone surrounds the border of the articular end of the femur with great regularity; in addition, several irregular pieces of new bone lie in the neighbourhood of the tubercle for the insertion of the lower end of the adductor magnus. The articular surface of the femur preserves almost its normal shape, and is partially eburnated. The corresponding surface of the tibia is much worn on the inner side. Its margin is surrounded by irregular nodules of new bone; similar masses surround the patella. The head of the fibula is ankylosed to the tibia.

From a pensioner over 60 years old, subject to chronic rheumatic arthritis. Many other joints were similarly affected. The bones of the opposite knee-joint are preserved in the Museum of the Charing Cross Hospital.

Presented by Edwin Canton, Esq., 1869.

1917. The right humerus of a Lion. The outer half of its inferior articular surface, after the removal of its cartilage, has been partially ulcerated, and presents a hard polished surface, grooved and perforated with numerous apertures, like those in worm-eaten wood. New bone is formed in

small, rough, and hard prominences around the borders of the articulation, and on some of the ridges of the shaft.
Hunterian.

1918. The left humerus of the same Lion, similarly and symmetrically diseased. *Hunterian.*

1919. The right radius and ulna of the same Lion. Nearly all the articular surface of the ulna is covered with hard polished bone, perforated like that on the outer or radial portion of the articular surface of the humerus. The borders of the upper part of the ulna and of the radius, as well as some of the ridges on their shafts, are covered with nodules of new bone. The articular surface of the radius is nearly healthy. The other ulna, symmetrically diseased, is preserved in No. 1286, and some of the other bones in Nos. 1770 and 1772. *Hunterian.*

1920. Portions of a left ilium and femur, displaying the hip-joint affected with rheumatic arthritis. The inner surface of the synovial membrane is covered with pedunculated fibrous and dendritic growths, some of which contain masses of osseous material. The head and neck of the femur have been worn away; and a smooth eburnated surface of bone was in apposition with the acetabulum ; this surface is below and behind the point where the base of the neck joined the shaft. The inner part of the upper extremity of the shaft was in contact with the upper margin of the acetabulum, which is unusually prominent from the formation of new bone upon it ; the cartilage of the acetabulum is replaced by a finely nodulated fibrous tissue; and its cavity is occupied by fibrous pedunculated growths from the synovial membrane. A large smooth exostosis, seven and a half inches in length, is attached to the front and outer surface of the upper extremity of the femur just below the great trochanter ; it lies parallel to the shaft, and apparently occupies the position of the vastus externus muscle. Another more slender process of bone, four and a half inches in

length, extends over the front of the capsule of the joint; it is attached below to a large irregular mass of osseous material within the inferior portion of the capsule, and passes upwards over the pectineal eminence in the position of the psoas and iliacus muscles. This process of bone was, perhaps, at one time connected with the trochanter minor, and probably was separated from the shaft as the femur became displaced upwards by the wearing away of the head and neck.

From a master baker, aged 57. Between five and six years before he came under observation he had what he called erysipelas over the right thigh and hip, without any previous accident or injury, and without any pain—the parts being red and swollen. Before this attack he had often complained of swelling of the thighs at night, and an inability to walk far on account of a feeling of weakness in the limbs. His power of locomotion diminished steadily, the right limb becoming shortened, for which he wore a thick shoe. About two years afterwards the opposite thigh went through a similar change, and commenced to shorten; the high shoe on the right foot was therefore laid aside, and the patient took to use a crutch and a stick. In walking, each leg shortened with a soft rubbing or crushing sound as the weight of the body was thrown upon it, the great trochanter rising far above its usual position; the shaft of each femur was at the same time directed outwards and backwards, a singular depression being produced over the sacrum.

His general health had always been good, with the exception of occasional severe "bilious attacks," occurring every three months, during which he was confined to bed and vomited large quantities of "bile." At length standing became impossible, and he was often troubled with a feeling of tightness and numbness in the thighs. About six months before death violent sickness came on; the urine was scanty and dark red in colour; the hands became swollen and painful; and for five days before death no urine was passed. The patient had been twice married; by his first wife he had six children, who were all dead when he gave this account of himself. After his second marriage, during a period of twenty years, he had wholly wanted sexual power; at this time his habits were abstemious. His symptoms were such as might be referred to locomotor ataxy.

Post-mortem Examination.

The heart was small, pale, and flabby. The stomach contained a coffee-coloured fluid; its mucous membrane was mottled with hæmorrhagic spots as large as the end of the finger. In the kidneys, the tubules of the medullary portion were denuded of epithelium, and some contained much granular matter; the corti-

cal portion was streaked with a yellow substance, showing acicular crystals under the microscope. The general condition of the opposite hip-joint was but little different from that shown in the specimen.

Presented by Richard Quain, Esq., 1882.

Articular Changes in Locomotor Ataxy.

1921. The upper end of a humerus, from a case of locomotor ataxy. The head has entirely disappeared; and a smooth, partly eburnated surface is left, surrounded below its margin by a few bony outgrowths, the largest of which overhang the bicipital groove.

The preparation is figured and described by M. Charcot in his 'Leçons sur les Maladies du Système nerveux,' Jan. 1, 1875, 2nd ed. p. 120. He writes thus:—"Outre l'usure des surfaces articulaires, qui est poussée très loin, vous reconnaissez ici la présence de corps étrangers, de stalactites osseuses, et en un mot, de tous les accompagnements habituels de l'arthrite déformante." M. Charcot goes on to say that, from the fact that they are absent in other cases, he thinks the osteo-arthritic conditions were accessory and produced by the more or less energetic movements which the patient gave to his limbs.

Presented by Professor Charcot, 1877.

1922. The bones of a right upper extremity. All the bones appear lighter than normal, the scapula especially being unusually thin and transparent. The glenoid cavity and the head of the humerus have been completely absorbed. The tuberosities alone remain. Upon the inner surface of the shaft of the humerus, just below the tuberosities, is a concavity, directed from above downwards, and which has extended half through the bone, so that the medullary canal is widely exposed. The concavity has apparently been produced by the friction of the displaced humerus against the semilunar concavity of the scapula, upon which it moved. The elbow-joint appears natural; but the bones of the wrist-joint are extensively destroyed. The lower extremity of the ulna has completely disappeared; the articular surface of the radius is deeply worn away, especially on the palmar surface. The carpal bones are represented by

some irregular atrophied masses; and their characteristic shapes are nearly lost. The proximal articular surfaces of the metacarpal bones are also partially destroyed. The exposed bony surfaces are everywhere porous and no new bone has been formed around them, except some scarcely noticeable spicules.

1922 A. The bones of the left knee-joint of the same patient. The external condyle is extensively destroyed, but the internal condyle only superficially; in both, the exposed cancellous tissue appears healthy, but its meshes are widened. The articular surface of the tibia presents two deep concavities for the condyles of the femur; they are separated by a prominent ridge, which projected into the intercondyloid notch. On the surfaces of the concavities the cancellous spaces are in part filled up with bone, and are smoother than are the condyles of the femur. The patella is much thinned by destruction of its articular surface. The bones generally are light and atrophied.

From an Irishwoman, aged upwards of 60, who was emaciated and bed-ridden. The following account of the case accompanied the specimen:—

"Her joint-changes are symmetrical; and those most like locomotor ataxy occur in the shoulders. There is a deep hollow under each acromion, and the head of the humerus has evidently been absorbed to a great extent. It is somewhat displaced towards the axilla, but there is no complete dislocation. The clavicle is loose at both ends. Both elbow-joints are distended and bulging, and yet loose. The bones grate on movement, but she complains of no pain. The wrists and knees are in a similar condition, with the exception that the knees are flexed and somewhat stiffened. The wrists are greatly distorted. There is not the slightest swelling of the parts adjacent to the joints; and the intervening parts of the limbs are wasted to extreme thinness. The feet are not now affected; and the fingers look quite natural, but on examination many of their joints are loose and grate on movement. Here, also, movement gives no pain. There are decided, though small, sharp lips on the ends of the phalanges. The poor woman's pains have been excessive, and have been of the stabbing and grinding character. She has been worn down by pain, but still, as regards motion, the joints appear to be deficient in sensation. This character, together with laxity of ligaments, distention of

synovial sacs, and absorption of articular heads (those of the humeri) are just the features of Charcot's joint-disease. It may be that the woman is ataxic; and in a poor bedridden cripple it is not very easy to decide this point. She says that her malady began about eight years ago in her shoulders. Her pupils act, though rather sluggish; and she has no bladder symptoms. If, however, it be thought probable that ataxia is present, the case still remains chiefly one of general rheumatism; for the joints are or have been almost all affected, and with remarkable symmetry, whilst none are positively dislocated."

The woman died in October 1880, four months after the above notes were taken. See Mr. Jonathan Hutchinson's Lectures on the Arthritic Diathesis, p. 273.

Presented, with the preceding specimen, by Jonathan Hutchinson, Esq., 1881.

1922 B. The bones of the upper arm and forearm, from a prematurely aged woman. They show changes somewhat like those in the two preceding specimens. The humeri are lighter and shorter than usual (the patient was 5 feet 2 inches in height); their shafts are slender; their lower ends had undergone such degenerative changes that, although they appeared normal when first dissected, a great part of the bone broke-away completely on maceration. A section has been made into the head and upper part of the shaft on the left side; but here the bone is less atrophied. The radius and ulna are short, imperfectly developed, and more or less distorted on both sides; the head of the right radius has undergone the same changes as the lower end of each humerus, and has broken down in maceration.

The patient was 54 years old, and died of pulmonary disease in a workhouse. The forearms had been deformed from birth; no other bones or joints were diseased; the lower extremities were well-formed. For a further account of the case, see Trans. Path. Soc. vol. xxvii. p. 314.

Presented by Alban Doran, Esq., 1875.

Morbid Growths and Pendulous and Loose Bodies in Joints.

1923. A vertical section of the knee-joint of a young person, nearly all the cavity of which is filled with a tumour projecting into it from behind, and surrounding the crucial liga-

ments, one of which is shown on the surface of the section. The tumour is lobulated and appears to be composed of firm and elastic, fibrous, vascular substance: it has united with the surfaces of the cartilages with which it is in contact; and the cartilages themselves are very thin. The upper and anterior part of the joint, upon which the tumour has not encroached, is healthy. *Hunterian.*

1924. A knee-joint in which there was a loose cartilage. The articular cartilage has been removed from the greater part of the patella; the portions near the borders alone remain. The cartilage of the external condyle of the femur has been removed to a similar extent; and the surfaces of bone thus brought into contact, and rubbed against each other in the movements of the joint, are hardened, polished, and worn down in parallel grooves as if they had been chiselled. The remains of the articular cartilage on both bones are thin, and in many places degenerated into a soft fibrous substance. Around their borders the bones are thickened and beset with projecting osseous plates and nodules. At the upper part of the patella two of these nodules are of considerable size, and are referred to by Mr. Hunter, in the following case, as offering some explanation of the occurrence of loose bodies in the joint.

"In 1759, I stripped the bones of an old woman that died in St. George's Hospital. I knew nothing of her history. In the stripping I observed many exostoses, especially upon the vertebræ. In taking off the flesh about the knee, and cutting into the capsule, there came out a stone, or bone, about the bigness of a nut, flattened. I opened the joint more, and extracted three more, lying under one of the heads of the gastrocnemius muscle at its origin. On turning down the patella I saw that the cartilage was almost eroded off both it and the end of the femur, in parallel grooves; and upon the upper edge of the patella, close to the cartilaginous surface, there was an exostosis, which was broad and thin, shooting up under the tendon of the rectus, &c. This was partly divided into two: and both seemed to have been broken from the patella, and closely united by a ligamentous substance. The inner surface of the joint was ragged, and the synovia thick, and in some parts seemed to be mixed with matter.

"I examined the joint of the ankle, and observed a piece of bone about the bigness of a pea within the cavity of the joint, but attached to the ligament of the joint by a strong ligament; how-

ever, it was loose, so as to be moved from side to side. Both these I have prepared.

"The other knee was much in the same condition, besides which there were three small ones on the inside of the tendon of the popliteus muscle, just like maggots, and were attached to the tendon by membrane. This last I have likewise prepared, and have put one of the bones with it into the spirits.

"These explain those cases in surgery where we find a movable cartilage or bone in the joint of the knee.

"She had two stones in the gall-bladder; one very large, the other smaller, which was at the fundus, and had two smooth sides which had rubbed upon the end of the great one, for it had a similar smooth end."—*Hunterian MS.; Account of the Dissections of Morbid Bodies*, p. 70, No. 54.

The charaeters of the disease, so far as they are exhibited in the preparation, show that this was a case of fibrous degeneration of the articular cartilages, followed by removal of portions of the diseased structure, and hardening and polishing, or, as it has been called, *eburnation* of the surfaces of the bones thus exposed and subjected to mutual friction. The loose bodies found in joints are, sometimes, portions of bone or cartilage which have been broken-off or gradually separated after injury; but there is not any evidence that those found in this case had such an origin. Probably they were similar, both in structure and in mode of growth, to those formed in the two following specimens, in both of which there is a similar chronic disease of the cartilages and other tissues.

Hunterian.

1925. A knee-joint, to the walls of which many pendulous masses of bone and cartilage are attached. The extremities of both the femur and the tibia are greatly enlarged, especially by the heaping-up of bone in large nodulated masses around the borders of their articular surfaces. This formation of new bone has taken place, chiefly, upon the outer condyle of the femur and the corresponding surface of the tibia, from both of which, also, nearly all the articular cartilage, after fibrous degeneration, has been removed, leaving the subjacent bone smooth and hard. The same changes, in a less degree, have affected the inner condyle of the femur and the rest of the articular surface of the tibia. The pendulous bodies are between fifteen and twenty in number: they are all attached by one of their surfaces, or by portions of tough fibrous tissue, to the walls of the joint or to the masses of bone around its borders. They are irregular in form and size, varying from half an inch to nearly two

inches in diameter; their surfaces are nodulated and, for the most part, osseous; but they present isolated portions of substance like semitransparent bone-cartilage. They lie in various parts of the joint; and some small ones at the back appear to have formed externally to it. The fibrous tissues around the joint are all thickened, and strengthened with bands supporting and connecting the several pendulous growths. *Presented by Sir William Lawrence.*

1926. A knee-joint, in which are two small growths of, apparently, cartilaginous and osseous substance. The largest of them, attached to the crucial ligaments, has an oval outline, measures nearly an inch in its greatest diameter, is flat on its lower, and very convex on its upper, surface. By friction and constant pressure it had worn for itself a deep cavity, with hard grooved walls, in the posterior and lower part of the outer condyle of the femur: in this cavity it lay imbedded, and apparently immovable. Another pendulous body of small size, and irregular in form, is attached near the preceding; and a third, which is intermediate in size, and presents on its surface distinct nodules of cartilage, is fixed to the synovial membrane just below the patella. The greater part of the articular cartilage has been removed from the surfaces of the bones; what remains is thin and, in parts, especially on the middle of the patella, cracked, fibrous and shreddy.

From the Museum of Sir A. P. Cooper.

1927. The lower end of a humerus, on which, in the posterior fossa between the condyles, are two pendulous masses of bone and cartilage. One of them is attached by a slender pedicle, the other by a broad base; the synovial membrane appears to be continued over both. Some flattened nodules of new bone are attached to the corresponding anterior surface of the humerus: its cartilage appears healthy.

Presented by Sir William Blizard.

1928. A right elbow-joint, which contained the two loose nodular bodies now lying at the bottom of the bottle. One of them

adhered to the inner surface of the posterior ligament, and was smooth and concave towards the trochlea. The other was in front, over the radio-ulnar articulation. The front of the coronoid process is roughened and tuberculated. A large portion of the articular cartilage is removed from all the bones, leaving the subjacent surfaces of bone hard and smooth, and grooved on the olecranon.

From a man aged 54. The bodies were found to consist of bone; they were unattached, and did not affect the motions of the joint. No disease was found in any other joint excepting the opposite elbow; and nothing unusual was observed in the elbows before death.

Presented by Richard Partridge, Esq., 1871.

1929. The left elbow from the same patient, showing similar, nearly symmetrical morbid changes, with two loose bodies. The articular borders of the humerus and ulna are more nodular. *Presented by Richard Partridge, Esq.*, 1871.

1930. The bones of an hip-joint, with a mass of cartilaginous and bone-like substance, which lay loose in the cavity of the joint. The mass (which is now artificially fixed to the head of the femur) has an irregularly oval form; it is convex on one surface and concave on the other, in adaptation to the head of the femur; it measures two inches in its chief diameter, and is coarsely granulated on its surface. The head of the femur is expanded at its base, flattened, rough, and nodulated; the neck is shortened, and the upper margin of the head is half an inch below the level of the top of the trochanter.

From the Museum of Sir A. P. Cooper.

1931. An irregular nodule of bone from a knee-joint. It is hard and has shreds of lymph adhering to it. There is no indication of its ever having formed a part of the normal articular surface, and no broken part to show that it had separated from any pedicle.

From a retired army surgeon, aged 43. He was of a rheumatic diathesis, and for some time had suffered from grating and stiffness in his right knee. About two months before the specimen

was removed he struck his knee sharply, and the next day found a loose body in the joint. He had no synovitis or pain. After the accident he missed a lump which he had noticed previously over the inner condyle. The loose body was excised, and he did well.

The case is recorded in the 'British Medical Journal,' 1876, vol. i. p. 403; Case 1.

Presented by Richard Barwell, Esq., 1876.

1932. Four cartilaginous bodies removed from a knee-joint. They are very tuberculated externally; the lowest, which is laid open, is partly ossified; its interior consists of rather close cancellous tissue.

Presented by Sir James Paget, 1880.

1933. Numerous portions of cartilaginous substance from the cavity of a false joint formed after an ununited fracture of the humerus.

A large number of similar substances from the same cavity are preserved in No. 823; with the description of which, also, the history of the case is recorded.

Hunterian.

1934. Section of a small loose cartilage removed from the knee-joint. Its surface is flat, with numerous grooves and depressions; its texture appears to be uniform.

The removal of the cartilage by incision into the joint was followed by severe inflammation and suppuration; but the patient recovered.

Presented by Joseph Swan, Esq.

1935. A loose body from the knee-joint, partly bony, partly cartilaginous. The bone is hard and irregular, forming a concavity which is filled-up with cartilage so that the whole forms a solid mass, convex on the one side and nearly flat on the other. The body has the appearance of the bony outgrowths formed in osteo-arthritis; but there is no evidence that it ever formed a part of the normal surface of the joint, or was ever pedunculated.

From a man aged 40. The body was detected after a severe twist of the knee, and was excised during the patient's lifetime.

Presented by Sir William Fergusson, 1874.

1935 A. Six loose cartilages from a knee-joint which contained over two hundred of them. They are irregular in shape, finely nodulated, and composed of hyaline cartilage.

From a man aged 31, whose right knee-joint had been gradually enlarging with much pain for six years. The synovial membrane was immensely distended with the loose cartilages, and felt like a bag of peas. The joint was freely laid open, and the cartilages, which were all unattached, were removed. No other joints were affected. He had had four attacks of acute rheumatism.

Presented by Thomas Smith, Esq., 1883.

1936. Casts of two large loose cartilages from the knee-joint.

From a man aged 43, of very intemperate habits. At the age of seventeen swelling of the knee commenced, with severe and constant pain, without any assignable cause. Three years later, the pain continuing, the patient discovered a movable tumour in the right knee, which gradually increased in size. A similar tumour appeared soon afterwards in the left knee. These growths impeded walking and caused great pain. The cartilage was excised from the right knee by a valvular incision, closed by collodion; a similar operation was performed on the left knee ten days later. No inflammation followed; and the patient afterwards walked with perfect ease. The larger cartilage weighed 283 grains, the smaller 257 grains. (See 'American Journal of Medical Sciences,' vol. i. p. 303.)

Presented by the Harvard University, Boston, U.S., 1874.

Gouty Formations in Joints.

1937. A carpus, with white, powdery, gouty deposit on the articular cartilage of the trapezium. Some of the other cartilages are thinner than is natural. *Hunterian.*

1938. The proximal end of the first phalanx of a finger, with gouty deposit on its articular cartilage. *Hunterian.*

1939. Parts of a wrist and hand, with several of the joints laid open, to show thin layers of gouty deposit upon their articular cartilages. In some parts, also, a similar material is deposited in the tissues around the joints.

From the Museum of George Langstaff, Esq.

1940. The other wrist and hand of the same patient, similarly diseased, dried after the injection of the vessels.

The patient had cirrhosis of the liver, and died with empyema and pericarditis.

From the Museum of George Langstaff, Esq.

1941. The left hand of a man aged 65, who was subject to gout. It is dissected to show deposits of urate of soda on the articular cartilages and ends of many of the bones. Extensive deposits of similar substance are also shown on the tissues of the dorsal surface of the fingers. These deposits were semifluid in the recent state.

1942. The right hand of the same patient. The articulations of the fingers appear irregularly swollen and partially dislocated. In both hands the fingers are abducted and partially flexed, and the second and third fingers show morbid flexion of the first, extension of the second, and flexion of the third phalanges.

1943. A knee-joint, with a thin layer of white gouty deposit covering nearly the whole of the articular cartilages of the femur and patella. A considerable quantity of the same material has been deposited on the adjacent parts of the synovial membrane. The cartilages themselves are thin, greyish, and in some places rough and nodulated.

Hunterian.

1943 A. A patella, of which the articular surface is covered with a thick white deposit, found, on testing, to be urate of soda.

From a plumber, aged 46 years, in many of whose joints there was a similar deposit, and also upon the pia mater. He had had gout for many years. (See Trans. Path. Soc. vol. xxxiii. p. 271.)

Presented by Dr. Norman Moore, 1882.

1944. A patella, from the posterior surface of which the cartilage

has been removed. The exposed bone is highly polished, and exhibits white specks of deposit of urate of soda. Large nodular outgrowths of cartilage and bone spring from the sides of the bone. *Presented by Edward Cock, Esq.*, 1870.

1945. The metacarpal bone and first phalanx of the great toe of the patient from whom the preceding specimen was removed. White deposits of urate of soda exist in the cartilages. *Presented by Edward Cock, Esq.*, 1870.

1946. Part of a tarsus, with very thin layers of gouty deposit on the proximal articular cartilages of the cuboid and scaphoid bones. *Hunterian.*

1947. Parts of a carpus and metacarpus, with gouty deposits on the back of the metacarpal bones. Parts of two small cavities, like abscesses, are also shown, in which, probably, gouty matter was contained: they do not communicate with any of the joints. *Hunterian.*

1948. A thumb, in which the articular cartilages of its metacarpal joint have gouty deposits, are irregularly thinned, and have had their margins removed. Over the articulation of the phalanges is a cavity, which contained gouty matter and communicated with the joint. *Hunterian.*

Osseous Ankylosis.

1949. The bones of a face. On the left side complete osseous union has taken place at the temporo-maxillary articulation. A vertical section through the upper part of the ramus of the jaw and the temporal bone at the base of the zygoma, on this side, has exposed an uninterrupted surface of apparently healthy cancellous tissue, bounded on each side by a compact wall, and continuous with the original cancellous tissue and diploe of the bones. On the right side the form of the bones in the corresponding joint is altered. The middle part of the condyle has been removed, and in

place of the slight convexity of its articular surface there is a deep transverse concavity, occupied with a growth of bone projecting from the middle of the glenoid cavity, and forming a new joint with it. The whole of the lower jaw is atrophied: all its teeth have been removed except the two middle incisors; and these project unnaturally from their alveoli, filling up a gap left by the removal of the corresponding incisors of the upper jaw. The tissue of the upper jaw is thin, light, and spongy.

The ankylosis had existed for more than fifty years.

From the Museum of John Howship, Esq.

1950. An occipital bone to which the atlas is very intimately united by bone. The line of union between the anterior arch of the atlas and the basilar process is only indicated by two small foramina close to the anterior tubercle. The posterior arch is only partially united to the margin of the foramen magnum; and a trace of separation between the occipital condyles and the superior articular surfaces of the atlas can be distinguished, especially on the left side.

Presented by Luther Holden, Esq., 1879.

Osseous Ankylosis of Bones of the Upper Extremity.

1951. Part of a left scapula and humerus, with a complete osseous ankylosis of the shoulder-joint. The greater part of the head of the humerus must have been destroyed by ulceration or absorption. The shaft is drawn upwards, so that the great tuberosity is very close to the acromion. The texture of the bone about the point of junction and in the tuberosities is light, friable, and greasy.

1952. The bones of an elbow-joint, so closely and smoothly united by bone that only traces of the forms of their articular surfaces can be discerned.

Presented by Sir William Blizard.

1953. A right humerus and ulna, closely and smoothly united by bone, but presenting some distinct traces of their original shapes. They form an angle of about 145°. The lower end of the humerus is narrowed, and presents, in front and on its outer side, a deep oval cavity, in which probably the head of the radius was lodged.

1954. A left humerus and ulna, apparently from the same person as the preceding, diseased in exactly the same manner.

1955. A left humerus and ulna, of which the corresponding articular extremities are closely and smoothly united by bone. Their axes form an angle of 120°. The ends, as well as the shafts of the bones, are diminished in size; and the outer condyle of the humerus is reduced to a narrow cylindriform projection. There is also a deep ulcer in the great tuberosity of the humerus; and the shaft of the ulna is unnaturally curved. *Hunterian.*

1956. A right humerus, radius, and ulna firmly and smoothly united by bone. The upper part of the radius has lost its original shape, is smooth and flat, and measures about an inch in its vertical diameter and less than half an inch in thickness. It is continuous, by smooth uninterrupted surfaces, with the front and lower part of the humerus, which is nearly as much reduced in breadth, so that the two together appear to form a single bone, laterally flattened, and bent to a right angle at the elbow-joint. There are imperfect traces of the condyles of the humerus. To that which represents the inner condyle the ulna is closely united; and its shaft is extended in a line parallel with and directly below that of the radius. All the bones are reduced in size; but their tissue is firm and healthy.
Hunterian.

1957. A right humerus and ulna firmly united by bone. The lesser sigmoid cavity has become almost completely effaced;

but on the anterior aspect of the outer condyle of the humerus is a smooth depression with an elevated margin of new bone externally. This evidently represents part of a new joint with the radius.

Presented by Joseph Hodgson, Esq., 1869.

1958. A radius, carpus, and metacarpus. Their articular surfaces are all closely and smoothly united, so that in the place of the wrist-joint there appears but one continuous mass of bone. The hand is in the position of extreme extension and abduction.

From the Museum of Robert Liston, Esq.

1959. The lower part of the right ulna and radius, with the bones of the hand. The radius, ulna, all the carpal bones except the pisiform, and the three middle metacarpals are firmly united by bone. A large irregular hollow space on the dorsal surface of the carpus indicates extensive ulceration and loss of bone at some former period. This is compensated and the wrist is strengthened by deposition of firm smooth bone over the palmar surface of the same region. It is probable that this specimen is an example of complete healing by ankylosis after carious disease of the wrist-joint.

Presented by Gilbert W. Mackmurdo, Esq., 1867.

1960. The lower end of the left radius, with the carpal and metacarpal bones, of a Horse. There is an accumulation of hard irregular masses of new bone about the carpus and upon the corresponding ends of the radius and metacarpal bone. Three of the carpal bones are firmly ankylosed to the radius, and the remainder to the metacarpal bone. The surfaces by which the carpal bones articulated with each other are healthy. *Hunterian.*

1961. The upper part of the right metatarsal bone of a Horse, surrounded by nodulated hard new bone at its articular extremity, and firmly united with the bones of the tarsus.

The chief bond of union appears to have been formed by the coalition of the growths of new bone extending from the several bones over the margins of the joint.

Hunterian.

1962. The left metacarpal bone of an Ox, with the first phalanges and sesamoid bones. They are all firmly united together by new bone, formed around and between their adjacent articular surfaces. Most of the new bone, which is formed external to the joints, is in smooth hard plates, extending from one bone to the other and fixed to both. *Hunterian.*

1963. The last two phalanges of a little finger, closely and smoothly united by bone. There is scarcely a trace of their original outlines.

The ankylosis was the consequence of a whitlow, which had existed many years before the removal of the finger.

From the Museum of John Howship, Esq.

1964. The bones of a finger in which all the articulations are closely and smoothly united by bone. The first two phalanges are in the half-bent position; the last is turned towards the side, at nearly a right angle to the second.

The changes were the consequence of whitlow.

From the Museum of Robert Liston, Esq.

Osseous Ankylosis of Bones of the Lower Extremity.

1965. A male pelvis, in which both the sacro-iliac symphyses are completely and smoothly united by bone. The union appears to be through the whole extent of the joints; and there is scarcely any accumulation of bone upon their borders. The pelvis is in other respects well formed; but its bones are light. *Hunterian.*

1966. An os innominatum and an os sacrum, united by a smooth plate of bone extending across the anterior part of their symphysis. *Hunterian.*

1967. A left os innominatum and the upper part of the femur, firmly and smoothly united by bone. A section has been made through the ankylosed parts. The continuity of both the compact and cancellous tissues is nearly perfect.

1968. Part of a right os innominatum and the upper end of the femur, showing complete ankylosis after disease.

From a lady aged 21. Her symptoms began in December 1868; but it was not till April 1869 that the case was first recognized as one of disease of the hip. She had then severe twitching of the muscles of the right hip at night, apparent shortening of the leg, and pain over the joint. A splint was applied to the limb and worn for twenty-one months, viz. till March 1871. During this time an abscess formed and was opened, a sinus remaining afterwards. When the splint was discontinued she went to Eastbourne; and in six weeks' time she was able to walk on crutches, her general health was much improved, and the catamenia returned. She died in December 1872, after ten days' illness, with tubercular meningitis. (Path. Soc. Trans. vol. xxiv. p. 180.)

Presented by Benjamin Duke, Esq., 1872.

1969. A portion of an os innominatum and the upper end of the femur ankylosed. The section shows that the cancellous tissue of the head of the femur is closely blended with that of the interior of the os innominatum above; internally, the outline of the compact tissue remains distinct; below, the head of the femur is slightly separate from the acetabulum at certain points.

From a Dissection-subject, 1868.

1970. The bones of the knee-joint of a child. The patella is united by bone to the adjacent surfaces of both condyles of the femur, and new bone has been formed on its anterior surface. There is an extensive ulceration in the anterior part of the condyle; but the rest of the articular surfaces of both the femur and the tibia appear healthy. The tissue of the bone is very light and dry.

From the Museum of Joshua Brookes, Esq.

1971. The inner half of the left knee-joint of a child. The articular surfaces of the femur and tibia have been destroyed; and the bones have become partially united by osseous ankylosis. There are several cavities in the cancellous tissue; the largest of these is in the condyle of the femur; the smaller are filled with a white, soft, fibrous material. The head of the tibia is much deformed; and no traces of the epiphyses remain. Two puckered cicatrices are seen in the integument anteriorly.

The limb was removed by amputation on account of a persistence of disease in the interior of the condyles.

Presented by John Hilton, Esq., 1865.

1972. The bones of a knee-joint, closely united by osseous ankylosis. The union of the inner condyle of the femur with the tibia is complete, and extends over the whole of their corresponding surfaces; that between the outer condyle and the tibia is effected by several short but broad columns of bone, extending from one to the other, and leaving passages between them. In the outer condyle, and in the corresponding part of the head of the tibia, is a deep ulcerated cavity. The tibia and fibula are drawn outwards and a little backwards. The patella is ankylosed by bone to the front of the outer condyle of the femur; and its anterior surface and borders, like the surfaces of all the bones near the joint, are covered with nodules and large spicula of new bone. The texture of all the bones is light and spongy.

From a man 45 years old. Inflammation of the joint had been produced by a violent injury; and the limb was amputated.

From the Museum of Robert Liston, Esq.

1973. A femur and tibia, whose articular surfaces, after superficial ulceration, are firmly united by bone. They are fixed at an angle of about 150°; and within this angle, in the popliteal space, a strong portion of new bone passes almost vertically from the posterior surface of the outer condyle of the femur to the top of the tibia, binding the bones together.

and affording additional support to the femur. There is no lateral displacement. *Hunterian.*

1974. A femur and tibia, closely united by bone at the knee-joint. A section exhibits the complete continuity of both their cancellous tissue and their walls. The upper part of the tibia is much enlarged, and appears to have been the seat of necrosis. The bones are fixed at an angle of about 150°, and the tibia is drawn backwards; but they are not laterally displaced. *Hunterian.*

1975. Vertical sections of a femur and tibia, closely united by bone, at an angle of about 120°. The femur has been drawn inwards, and the tibia backwards. Both bones are flattened from side to side, and otherwise misshapen; their walls also are thickened, and more than usually compact.

Hunterian.

1976. The corresponding ends of a femur, tibia, and fibula, united by bone so closely that their cancellous tissues are continuous. The lower part of the femur is expanded and flattened anteriorly: the patella seems to have been broken from the outer condyle, to which it was probably ankylosed. The femur and tibia are united at an angle of about 100°, within which a strong round portion of bone connects their posterior surfaces.

A piece of a knife remains in the lower part of the external condyle, into which it was driven and broken during the infancy of the patient. It remained there to his death, in adult age, producing probably the disease which ended in ankylosis; and it could not now be pulled out without destroying the bone, which is firmly adherent to it, and appears healthy in its structure. The specimen is engraved in Cheselden's 'Osteographia.'

Presented by William Long, Esq.

1976 A. The bones of a left knee-joint firmly united by osseous ankylosis, with extreme displacement of the tibia and fibula outwards. The tibia and fibula are ankylosed to the

outer surface of the external condyle of the femur, and are bent upwards and outwards to such a degree as to form an acute angle with the outer surface of the femur. The patella is attached by bone to the trochlear surface of the internal condyle. The articular surface of the external condyle of the femur and the downward projecting portion of the internal tuberosity of the tibia have been destroyed by caries. All the bones are atrophied ; their walls are extremely thin, yielding to pressure ; and the meshes of the cancellous tissue are wide with delicate trabeculæ. On section, the cancellous tissue of the ankylosed bones is seen to be continuous, the line of union being almost undistinguishable.

From a lady aged 72 years, who, after confinement in bed for nearly a year with some abdominal affection, began to suffer from pain in the left knee, followed by gradually increasing swelling of the joint with ultimate loss of mobility ; the joint then presented the ordinary appearances of strumous disease. At first the limb was kept extended ; but as no splints could be borne, the displacement of the bones, shown in the specimen, soon resulted from the destruction of the joint and the action of the abductor muscles. The tibia was only slightly rotated outwards. The position of the leg was such that the patient could with ease place her hand on the sole while lying in bed upon her back. She died exhausted ten years after the commencement of the illness. (See MS. Notes, vol. iii. p. 161.)

Presented by Frederick W. Salzmann, Esq., 1882.

1977. A longitudinal section of an ankle-joint, showing disease between the tibia and astragalus, with bony ankylosis between the latter bone and the os calcis. The synovial membrane of the ankle-joint appeared, in the recent state, gelatinous, and much new bone had formed in the sole under the os calcis and scaphoid bone.

From a man aged 50, who, six years before amputation, hurt his foot and was told that some bones were broken. Splints were applied, and he was able to walk after seven weeks' rest ; but the movements of the foot were impaired. Two years later a horse trod on the foot ; and two years after this sores formed and bone came away ; the foot became quite crippled, and amputation was performed. The patient recovered.

Presented by Thomas Bryant, Esq., 1874.

1978. Section of the lower end of a tibia and part of a foot, exhibiting complete osseous ankylosis between the tibia, astragalus, os calcis, and os cuboides. The corresponding articular surfaces have been absorbed; and the dense outer wall and the internal cancellous structures are continuous from one bone to the other, there being but little indication of their original boundaries.

Presented by T. Blizard Curling, Esq.

1979. The bones of an ankle-joint, with the lower extremity of the tibia and fibula, the astragalus, and the os calcis in a complete state of osseous ankylosis. A considerable portion of the astragalus appears to have been absorbed.

Purchased, 1858.

1980. The bones of a tarsus, and three metatarsal bones, all united by bone, which both connects their substance and extends smoothly and continuously over their dorsal and plantar surfaces, and presents in some places a fasciculate appearance, as if the ligaments were ossified. The fifth metatarsal bone has been removed; and the corresponding articular surface of the cuboid bone is superficially ulcerated. The sole of the foot has lost its natural arch; but the several bones are not displaced from their mutual relations. *Hunterian.*

1981. A tibia and fibula, with the bones of the tarsus, all of which, retaining their natural forms and relative positions, are firmly united, both by the coalition of their tissue and by portions of bone arranged in fasciculated layers like ossified ligaments and adapted to them externally. A fracture of the lower part of the tibia and fibula is united with slight displacement. New bone has been formed over nearly all the shaft of the tibia. *Hunterian.*

1982. A similar specimen, with the addition of ankylosis between the tarsus and metatarsus. The changes were probably the

result of long-continued want of motion, and of the inflammation excited by necrosis or ulceration of portions of the cancellous tissue of the lower end of the tibia and of parts of the cuneiform bones. *Hunterian.*

1983. Vertical sections of a tibia, fibula, astragalus, os calcis, and os naviculare, all of which, after superficial ulceration of their several articular surfaces, are united by bone closely and without displacement. The long axis of the foot is directed obliquely downwards. The outline of each articular surface is preserved; the texture of all the bones is light and greasy. *Hunterian.*

1984. A right astragalus and os calcis, firmly and smoothly united by a thin smooth plate of bone laid over the inner margin of their anterior and inner articulation. *Hunterian.*

1985. The left astragalus and os calcis of the same person, united in exactly the same manner. *Hunterian.*

1986. The bones of a left tarsus, with the second and third metatarsal bones, all firmly united to each other by osseous formations between and around their articular surfaces.

1987. A cuneiform and metatarsal bone, united by a strong band of osseous substance passing from the lower border of one to that of the other. The rest of their articular surfaces appears healthy. *Hunterian.*

1988. The bones of the tarsus and metatarsus of a Horse, closely united by bone deposited between and in small quantity around their articular surfaces.

Presented by Sir Philip G. M. Egerton.

Dislocations consequent on Disease.

1989. A right shoulder-joint, with an unreduced subclavicular dislocation of the head of the humerus, probably due to disease of the joint, as there was evidence of chronic rheumatic arthritis of the knee and spinal column. (See No. 1905.)

"The head of the humerus is situated slightly external to the middle of the clavicle, within the coracoid process, resting against the first and second ribs, which have been divided and reflected to show the false joint from within. It is misshapen, the cartilage partly softened and flocculent on the surface and partly replaced by fibrous tissue. There are strong fibrous cords, two vertical and one horizontal, lying between the head of the bone and its bed on the ribs, formed by, and continuous with, the capsule. Except for these, the head of the bone is in contact with the ribs, which are partly excavated, having their surfaces covered with flocculent, imperfectly organized fibrous tissue. The new joint is formed of fibrous bands, with many filiform growths and some nodules internally, and continuous externally with the surrounding tendons.

"The glenoid cavity of the scapula is rounded and covered with fibrous tissue; its inner edge is absorbed, and covered with dendritic growths, being continuous with the interior of the new joint. The tendons of the posterior scapular muscles end in the fibrous tissue covering the glenoid fossa. The long tendon of the biceps is not distinguishable; the other tendons are uninjured."—*Notes of the Dissection by Professor Flower.*

Presented by John Hilton, Esq., 1865.

1990. An elbow-joint and a metacarpal bone. After long-continued disease of the elbow-joint the radius and ulna have been dislocated backwards and inwards. The sigmoid cavity of the ulna rests on the internal condyle of the humerus, and the radius on the trochlea, with its head projecting backwards nearly as far as the olecranon. The

joint is bent at a right angle ; and all the tissues around it are hardened and consolidated. The articular cartilage of the distal end of the metacarpal bone is in part ulcerated ; and its shaft appears to be surrounded with granulations.

From a boy, in whom the disease was the consequence of injury inflicted by swinging him on his extended arms.

From the Museum of Robert Liston, Esq.

1991. An elbow-joint. All the articular cartilages have been removed, probably after fibrous degeneration. The surfaces of the subjacent bones are uneven, hardened, and in parts nodulated, and covered with thin fibrous membrane. They are all much enlarged ; and new bone is accumulated in small nodules around their articular borders. The head of the radius is especially enlarged and misshapen ; it is dislocated forwards ; and rests on the front of the outer condyle. The ulna appears to have been moved outwards ; but this appearance is due, in great measure, to the enlargement of the internal condyle of the humerus. A strong and thick capsule of fibrous tissue surrounds the whole joint. *Presented by Joseph Swan, Esq.*

1992. A hip-joint in which, after the head and part of the neck of the femur had been destroyed by ulceration, the shaft was drawn up, so that the remains of the neck rest on the ilium just above the brim of the acetabulum. In this position the neck of the femur is fixed to the ilium by thick and tough bands of fibrous tissue. The capsular ligament has been removed ; the acetabulum is filled with dense fibrous tissue. The walls of the bones are very thin and light.

From a woman 70 years old. Ten years before her death she had an apparently scrofulous affection of the hip ; abscesses communicating with the joint opened in the groin ; and ultimately the limb was much shortened and inverted. The diseased parts, however, had completely healed. The patient died of apoplexy. After death her lungs and liver were found tuberculous.

From the Museum of George Langstaff, Esq.

1993. A vertical section of a knee-joint. The articular cartilages of the femur and tibia, and the greater part of that of the patella, have been removed. The surfaces of the exposed bones, especially the femur and patella, are slightly ulcerated. The epiphyses of the femur and tibia appear hardened; their shafts are extremely atrophied. The synovial membrane is thickened. The tibia is drawn far backwards, with considerable elongation of the ligamentum patellæ. The posterior part of the articular cavity is closed with lymph and the thickened synovial membrane.

Presented by Sir William Blizard.

1994. A longitudinal section of a left leg, including the knee- and ankle-joints. The shaft of the tibia has become necrosed, and is partially separated from its periosteum. The tibia is dislocated backwards to the popliteal surface of the femur, the periosteum and outer layer of which are inflamed and partly destroyed. The articular cartilage has been entirely removed from both joints. There is an ulcer with elevated edges on the skin of the lower part of the leg; and several sinuses, with exuberant granulations, open over the inner ankle.

From a youth aged 19, with a family history of phthisis. He sprained his ankle when in ill-health; and an abscess formed near the outer malleolus. Four months later the discharge from the abscess ceased, during a long voyage; but before landing in England he struck his left knee, which inflamed, and the ankle and leg rapidly fell into a worse condition, so that amputation was necessary. He recovered slowly.

Presented by Edward Cock, Esq., 1867.

1995. A section of a knee-joint, showing destruction of the cartilages and complete dislocation of the tibia backwards.

From a man aged 60, who, when suffering from suppurative inflammation of the knee-joint, refused to have the pus evacuated. The joint rapidly became disorganized and the leg was displaced backwards; the limb required amputation only six weeks after the commencement of the disease.

Presented by Henry Smith, Esq., 1875.

1996. A vertical section of a child's knee-joint. All the articular cartilages have been removed; the subjacent bones are superficially ulcerated, and in their whole texture light and thin. In the shafts of the tibia and femur the cancellous spaces of the medullary tissue are wide, and bounded by very long slender fibres of bone. The axes of the femur and tibia form an acute angle, the tibia being drawn backwards almost out of contact with the femur. Portions of glass are placed in several ulcerated passages leading from the joint through the integuments around it.

From the Museum of George Langstaff, Esq.

Excised parts of Joints.

1997. The head and neck of a humerus, excised from a man 21 years old. All the articular cartilage has been removed. The subjacent bone is superficially, and, for the most part, evenly ulcerated, light and spongy. The wall of the neck is thin, and its laminæ are expanded; there is a considerable formation of new bone on the tuberosities and about the attachment of the capsular ligament.

The patient was of scrofulous habit. An abscess in the shoulder, communicating with the joint, had long discharged profusely. After the excision of the head of the bone, the limb was fixed in one position, the discharge gradually diminished, and the recovery, though tedious, promised to be complete. When discharged from the Infirmary, the patient had some power of moving his limb.

From the Museum of Robert Liston, Esq.

1998. The bones of a right shoulder-joint from a man who died fifty years after the head, with about an inch of the shaft, of the humerus, and the glenoid cavity of the scapula had been removed on account of caries. The part of the neck of the scapula from which the glenoid cavity was removed is covered by dense smooth ligament; and a deposit of new bone lies anterior to it. A broad band of ligament two inches long connects the humerus to the scapula, and much ligamentous tissue has been formed below the coracoid and acromion processes. The latter is deeply notched, probably from congenital malformation. The ligament attached to

the edge of the acromion process appears to have been formed by atrophy of the deltoid muscle.

The patient, when 27 years of age, received an injury which caused chronic inflammation of the shoulder-joint; two years later (in 1814) excision was performed by Dr. Locock at the Northampton General Infirmary. The patient afterwards carried on his occupation as a sawyer for thirty-five years, the right arm being all that time strong and serviceable. The shoulder was removed and dissected on the patient's death in 1864, by the donor, to whom the part had been bequeathed. (See Trans. Path. Soc. vol. xvi. p. 216.)

Presented by George Harday, Esq., 1865.

1999. The head of a left humerus, excised for disease of the shoulder-joint twenty years before the patient's death. A large cavity, probably that of an abscess, and lined by thin membrane, involves the greater part of the articular surface and the great tuberosity. The cartilage has disappeared from the rest of the articular surface; and it is covered with granulations.

The patient was a mate of a South-sea whaler, and the excision was performed at the 'Dreadnought' Seaman's Hospital in 1840, after he had suffered from chronic suppurating disease of the joint, resulting from a slight blow received two years and a half previously. The bone around the glenoid cavity was not removed, as it did not appear affected further than by loss of its articular cartilage. The patient remained disabled for three years owing to suppuration and the formation of sinuses; at the end of that period he became a nurse in the hospital, where he remained, till his death, with sufficient use of his arm to perform all his duties efficiently. Owing to extensive suppuration, and in part perhaps to extensive incisions which had to be made, the muscles immediately surrounding the joint lost all power; but the humerus appeared to be firmly connected with the scapula, and followed all its movements.

Presented by George Busk, Esq., 1872.

2000. Section of the shoulder from which the preceding specimen was excised. The scapula is not ankylosed to the humerus, but a cavity exists between them which allows a small amount of movement. The deltoid, coraco-brachialis, pectoralis, and both teretes muscles were so completely converted into fat that it was only possible to recognize them by the course of their fibres. The supra- and infraspinatus,

though much changed, still retain somewhat the colour and aspect of muscle; the subscapularis was in a similar condition. The biceps is well-developed. The nerves and vessels appear healthy. The upper end of the humerus is narrow and tapering; it is surrounded by dense fibrous bands, which run towards the glenoid cavity and form a capsule to the new joint.

Presented by George Busk, Esq., 1872.

2001. The bones of the other half of the same joint, macerated. A few deposits of new bone, similar to those observed in cases of osteo-arthritis, may be seen on the extremity of the humerus, and on the base of the coracoid process and venter scapulæ immediately below it. The transverse ligament over the suprascapular notch is ossified.

Presented by George Busk, Esq., 1872.

002. A hip-joint from a case in which the head, neck, and trochanters of the femur were excised five years before death. Both the os innominatum and the remains of the femur are slender, small, and light. The upper part of the shaft of the femur is placed opposite the posterior part of the acetabulum, to which, as well as to the adjacent part of the ilium, it is firmly but movably attached by dense ligamentous tissue, portions of which appear to be formed of the capsule of the joint doubled-in between the bones. Connected with the same tissue, and with the upper part of the shaft, is a portion of muscle, enclosed and mingled with cellular tissue.

Four years and a quarter before the excision of the bone the patient, a boy, at that time 9 years old, was thrown down. The injury was followed by disease of the hip, which was treated with leeches, blisters, rest, and other usual means. Large abscesses formed and burst around the joint, with extreme pain and copious discharge of pus; and the head of the femur was dislocated far on the dorsum ilii. The patient was reduced to a very debilitated state, and during the two years and a half in which the discharge continued became exceedingly emaciated; but for some months before the operation no fresh abscesses formed, and the progress of the local disease appeared to be checked.

Mr White "removed the head and neck of the femur with a

portion just below the trochanter minor, from the dorsum of the ilium." "The operation was effected by dividing and separating the integuments from a little above the point of lodgment down to that opposite the site of the acetabulum. At this point the bone was divided with a small straight saw about two inches below the top of the great trochanter, raised with a spatula, and then carefully detached from the ilium. The knee, which had long been immovably imbedded in the opposite thigh, was now with facility brought into a straight line, and the whole limb was secured with a long splint, and treated as a compound fracture. The wound quickly healed, the various sinuses soon ceased to discharge, and the health of the patient rapidly improved. Within twelve months a most useful compensation for the loss of the original joint was obtained. Perfect flexion and extension, and every other motion except the power of turning the knee outwards, were restored; but the femur did not grow after the operation."

The patient lived five years after the operation; and died consumptive in 1827.

A further account of the case is in 'A System of Surgery, by J. M. Chelius; translated by J. F. South,' vol. i. p. 979 (London, 1847).

Presented by Anthony White, Esq.

2003. The corresponding articular extremities of a humerus, radius, and ulna, excised from a woman 35 years old. All the articular cartilages have been removed; and, except in one situation (on the head of the radius), all the subjacent bones are more or less deeply ulcerated. The exposed bone, as well as all that was removed, is light, dry and spongy; and in some places the layers of the compact substance are separated.

The patient had had disease of the joint during childhood, but had recovered. The disease, for which the excision was performed, was of nineteen months' standing. She recovered after the operation; and the joint was movable.

From the Museum of Robert Liston, Esq.

2003 A. A similar specimen.

From a woman, aged 26; she recovered from the operation.

From the Museum of Robert Liston, Esq.

2004. A similar specimen, except that the ulceration of the humerus and ulna is deeper and more irregular, and parts

of their ulcerated surfaces are united in a close osseous ankylosis.

From a woman 23 years old. The disease was of three years' duration, and accompanied with firm œdema of the forearm and hand. After the excision of the parts preserved she recovered, but with a stiff elbow.

From the Museum of Robert Liston, Esq.

2005. The lower end of the right humerus and the upper ends of the radius and ulna, excised for inflammatory disease of the elbow. All these bones are light and porous; and much new bone has formed around the humerus.

From a woman aged 40, in whom acute inflammation of the right elbow-joint had existed for two months.

Presented by Sir William Fergusson, 1870.

2006. An innominate bone with the head of the femur, from a man aged 24 years, on whom excision of the head of the femur, for acute hip-joint disease, was performed three months before death from phthisis. The base of the neck of the femur is rough and carious. The acetabulum is also carious, and much thinned at the lower part, where a large opening through the bone had been formed by the pressure of the head of the femur.

Accompanying Dr. Alexander's Jacksonian Prize Essay, 1882. *See Case* 53.

2007. A femur, the upper part of which was removed by excision about ten months previous to the removal of the lower portion by amputation. The excised parts include the head, which is eroded and atrophied, and the larger part of the great trochanter and neck, which together form two separate pieces. All consist of light, porous bone, with a very thin layer of compact tissue externally. The shaft of the femur is much atrophied, its compact wall being very thin. The part immediately below the site of the excision is rounded, and stalactitic processes of fragile compact new bone project from it. The cancellous tissue at this part, exposed by excision, is covered-in by a thin layer of bone,

part of which is smooth and appears to have formed an articular surface with the acetabulum.

From a youth aged 19. Hip-joint disease having existed for six or seven years, and many sinuses having formed, the head of the femur was excised with temporary general and local benefit. The sinuses soon opened again; and it was found necessary to remove the thigh at the hip-joint about ten months after the excision. The femur was united to the pelvis by a strong fibrous investment; it weighed $8\frac{1}{2}$ oz. after maceration; the weight of a normal femur of the same length, similarly prepared, being $17\frac{1}{2}$ oz. The patient recovered from the amputation. (See Trans. Path. Soc. vol. xxiii. p. 191.)

Presented by T. Carr Jackson, Esq., 1872.

2008. The head of a left femur. An irregular mass of granulation-tissue and fat is attached to the acetabular end of the ligamentum teres. This mass filled the acetabulum. The head of the femur beneath appears soft and abnormally porous; the bone near the great trochanter is likewise unhealthy.

From a boy aged 11. He had long-standing symptoms of iliac abscess, which opened, leaving sinuses. The head of the bone was excised, and in the operation was found to be dislocated on the dorsum ilii, the acetabulum being filled with a soft fungous mass, which appeared to spring from the structures at the insertion of the ligamentum teres. The acetabulum was healthy. The case is mentioned in the 'Lancet,' vol. ii. 1871, p. 218.

Presented by Sir W. Fergusson, 1871.

2009. A section of a longitudinally bisected ankylosed knee-joint. The femur and tibia are united to each other at an angle of 100°. There is no lateral displacement. The two medullary cavities are separated by tolerably compact bone nearly an inch in thickness. The prominent inner condyle of the tibia is soft and friable, as if undergoing interstitial absorption; and a strong layer of compact new bone has formed within it, continuous with the wall of the shaft.

From a woman whose knee-joint was excised by Sir P. Crampton at the County Dublin Infirmary, August 4th, 1823, and who died twenty-seven years after the operation.

Presented by Sir Philip C. Crampton.

2010. The corresponding ends of the tibia and femur with the patella of a young person. The articular surfaces are superficially ulcerated.

Excised and presented by G. M. Jones, Esq.

2010 A. The bones of a knee-joint twelve years after excision performed by Sir Wm. Fergusson. The bones are firmly united in accurate apposition; and the cancellous tissue of the extremities of the two bones is continuous. Upon their external surfaces are some irregular outgrowths of bone, apparently serving for the attachment of muscles.

The excision was performed for disease of the knee-joint in a lad aged 17 years. He died from the effects of caries of the lumbar vertebræ. The limb operated-upon had become strong.

Presented by Dr. Lediard, 1881.

2010 B. A section of the bones of a knee-joint which was excised by the donor. The bones are united in good position.

Presented by Sir William Fergusson.

2010 C. A section of the bones of a knee-joint after excision. The bones are firmly united by fibrous tissue ossified to a slight extent; and they are in good position with the exception of slight displacement backwards of the tibia.

Presented by Dr. Goodhart, 1882.

2011. Bones of a knee-joint, seventy-eight days after excision of their articular surfaces. The ends of the bones are nearly as flat as on the day of excision, and in the recent state were covered by the merest film of granulation. No bony union existed.

From a girl, aged 20, who was admitted into hospital for long-standing disease of the knee. She had an unhealthy, phthisical appearance, and amputation was recommended; but she refused to submit to any thing more than excision. This was therefore performed: and, as was anticipated, there was no subsequent repair. During her rest after the operation hæmoptysis came-on, with signs of phthisis in one lung. She rapidly became emaciated, and now consented to amputation. The stump, though slow in its

healing, gradually closed-up, and she left the hospital nearly well. She was able to walk on an artificial leg till shortly before her death from phthisis, 18 months after operation.

Presented by Henry G. Howse, Esq., 1874.

2012. Section of a left knee, one year and a half after excision of the joint. The ends of the bones are rounded, and separated by a considerable interval which is filled with fibrous material.

From a boy, aged 4½ years. The joint was excised for "pulpy disease" of the synovial membrane. Some sinuses remained open after the operation; and his friends being unable to take proper care of him, amputation was considered advisable. After it he recovered perfectly.

Presented by Henry G. Howse, Esq., 1876.

2013. A longitudinal section of the knee of a child, showing the state of its structures sixteen months after excision. The femur is somewhat rounded, the tibia flattened and eroded, and there is a considerable interval between the bones.

From a boy, aged 2½ years. The joint was excised six months after a fall which had caused it to inflame. Sixteen months after the operation the limb was flexed and in a bad position: amputation was therefore performed.

Presented by Henry G. Howse, Esq., 1877.

2014. Section of a knee-joint two years after excision. The bone at the resected ends of the tibia and femur is dense and hard, and a portion of new bone, also hard and compact, appears to have grown from the back of the condyle; but there is caries of the upper end of the tibia, and a large abscess behind the bones. Union between the bones is everywhere fibrous. The scar of the excision wound in the integuments has ulcerated.

From a young woman aged 20. After recovery from the excision she frequently fell, owing to want of bony union between the femur and tibia. After a severe fall violent inflammation arose, her health failed, and the leg was amputated.

Presented by George W. Callender, Esq., 1873.

2015. A section of a left knee from a case in which amputation was performed sixteen years after excision of the joint.

The end of the femur is rounded and capped by a layer of unhealthy bone which has necrosed. The head of the tibia preserves most of its natural contour. A cavity is seen between these bones, lined by a velvety vascular membrane, which communicates with the exterior by a sinus, through which a bristle is passed. The bones were freely movable on each other.

From a woman aged 28. Her left knee became painful when she was ten years old: and two years later, the symptoms never having perfectly subsided under rest, excision of the joint was performed by Mr. Lansdowne of Bristol. She remained a year in hospital, and did not even attempt to walk till ten months after the operation. Sinuses formed and closed and occasionally reopened; and she used crutches till she was 19 years of age. After that time she never had a useful limb, and moved about with a leathern splint around the knee, which was strained eighteen months before amputation, causing the sinuses to reopen and discharge. When admitted again into hospital, the limb was straight and in good position. In front of the joint was a horseshoe-shaped cicatrix, at either end of which were open sinuses; the muscles were fleshy; and there was six and a half inches shortening. The leg was freely movable on the thigh, with slight pain but no grating. The patient had no voluntary power to lift or bend the limb. Amputation was performed; and she soon recovered.

Presented by Henry G. Howse, Esq., 1871.

2016. Section of parts of a left femur and tibia amputated twelve months after excision of the knee-joint. Firm osseous ankylosis has taken place, the cancellous tissue of the two bones appearing almost continuous. The lower part of the femur is rough and covered with bony outgrowths.

From a man aged 22. A year before amputation he desired the removal of the left leg for old disease of the knee-joint; much against his own wishes, excision was performed, and from being emaciated he became comparatively stout. A few sinuses at length opened around the knee; and though he was assured they were only superficial and not connected with bone, he insisted on amputation, and died of pyæmia a fortnight after that operation was performed.

Presented by Sir W. Fergusson, 1868.

2017. Longitudinal section of the left foot of a child from which the astragalus was excised rather more than a year before amputation. The os calcis is tilted up, bringing the articular surface for the astragalus directly under the articular

surface of the tibia. The arch of the foot is by this means somewhat higher than usual. The parts appear to fit well together; and the operation, so far, was successful. The cartilaginous surface of the tibia, however, is diseased, and sinuses pass from an external aperture to the space between the tibia and os calcis. The cancellous tissue of the tibia above the epiphysis is soft and discoloured.

From a child aged 6. Twelve months before her first admission to Guy's Hospital her left ankle was injured. She could walk and run for two months without pain; and then the ankle began to swell. The disease appeared to be confined to the astragalus; and that bone was therefore excised. The wound healed; and she was discharged, apparently well, five months after. She was readmitted in a month with the cicatrix open; and in that state she remained for some months. By this time she had amyloid disease of her liver: and the foot was amputated with the hope of diminishing the suppuration and visceral disease. The stump healed; but the child died some months after with tubercular peritonitis.

Presented by J. Cooper Forster, Esq., 1872.

2018. A longitudinal section of a left foot, after excision of the astragalus. The specimen is partially macerated, but with the tendons preserved to show their altered relations. The arch of the foot is well preserved. There is union between the inferior articular extremity of the tibia and the upper surface of the os calcis by a distinct cartilaginous layer. There is a space between the upper and anterior portion of the os calcis, under surface of the scaphoid, and front of the tibia, which was filled with tough fibrous tissue; and there was a large synovial membrane, forming a joint possessed of extensive motion. The rest of the articulations are normal, though the calcaneo-cuboid is somewhat altered in position.

From a man aged 40. He dislocated his astragalus forwards and outwards, and was taken to the Charing Cross Hospital with his foot inverted and resting on its outer side. The head of the astragalus projected in front of and on a level with the outer malleolus. The bone was excised; and the patient was afterwards able to walk well. He died of paralysis. The case is recorded and figured in 'Hancock, On the Surgery of the Foot and Ankle-joint,' pp. 250, 262.

Presented by Edward Bellamy, Esq., 1876.

The principal specimens of Diseases of Joints in other parts of the Museum may be found by reference to the Indices of Series XI., Subdivision D in Series XII., and in the next Series.

Series XIV.—INJURIES AND DISEASES OF THE VERTEBRAL COLUMN.

Atrophy: 31, 2019, 2020.
Fracture, Dislocation: 2021 to 2035.
Periostitis; Osteo-arthritis; Growths of Bone: 2036 to 2060, 2100 to 2104, 2107 to 2109.
Abscess; Ulceration; Caries; Tuberculosis: 2061 to 2081, 2093–4, 2110–11.
Necrosis: 2082–3.
Osseous ankylosis: 2084 to 2092.
Compare 2046 to 2050 e. s.
Dislocation after disease: 2093 to 2095.
Lateral Curvature: 2096 to 2106, 2044, 2045.
Posterior Curvature: 2107 to 2109.
Angular Curvature: 2110, 2111, 2028, 2062, 2066–7, 2070 to 2073.

Atrophy.

2019. Five dorsal vertebræ, from which nearly all the compact osseous tissue has been removed. Except at their upper and lower margins, the bodies consist of only very light cancellous tissue; and the surfaces of the spinous processes, arches, and other parts present numerous small apertures, from which, by gradual thinning and atrophy, the superficial compact layer has been removed. The remaining cancellous tissue is very light, dry, with very wide spaces and portions of fatty matter in it. There is not any distortion of the spine.

From the Museum of Robert Liston, Esq.

2020. Five lower dorsal vertebræ, the bodies of which were absorbed to a considerable depth, anteriorly and laterally, in consequence of the pressure of an aneurismal sac. The intervertebral cartilages appear healthy and project from the cavity formed by the absorption of the vertebral bodies.

Presented by Sir William Blizard.

Fracture and Dislocation.

2021. The first three cervical vertebræ of a gentleman who was killed by being thrown from his horse and falling on his head. The posterior segment of the ring of the atlas was broken off, and the spinal cord and its dura mater were lacerated. There is not any displacement of the vertebræ; and the transverse ligament is perfect, and retains its usual relations with the odontoid process.

From the Museum of George Langstaff, Esq.

2022. The upper part of a vertebral column, with the corresponding portion of the spinal cord. A fracture extended through the right halves of the arches of the third, fourth, and fifth cervical vertebræ, and through the body of the fifth, which was so displaced that the spinal cord was firmly compressed by it.

The patient, a man between fifty and sixty years old, fell down stairs, and remained for some time as if dead. Half an hour after, his arms and legs were completely insensible and motionless, and he had great difficulty of breathing. He spoke in a whisper, and had much pain when the cervical vertebræ were pressed.

He died two hours after the fall. Much fluid was found within the dura mater of the spinal cord, but no effused blood either within or without it.

The case is further related in Mr. Swan's 'Treatise on Injuries and Diseases of the Nerves,' p. 223.

Presented by Joseph Swan, Esq.

2023. A section through part of a vertebral column from the axis to the third dorsal vertebra inclusive. The bodies and laminæ of the fifth, sixth, and seventh cervical vertebræ are blended together by bone. The body of the sixth is displaced; it projects backwards so as to narrow the calibre of the vertebral canal; and there is a cavity in its cancellous tissue anteriorly. The intervertebral cartilages have disappeared; but their outlines are still marked, and their places occupied by bone.

From a countryman aged 35, who, fourteen years before his death, fell from a tree and injured his neck. For a few weeks

there was paralysis of all the voluntary muscles; then the muscles of the head and neck recovered power, and permanent paralysis of the trunk and extremities remained. He passed much of his time in writing and sketching with a short pencil placed between his teeth. (A full account of the case is in Mr. Hilton's work 'On Rest and Pain,' 3rd ed. p. 116.)

Presented by John Hilton, Esq., 1872.

2024. Part of a spine with laceration of the intervertebral substance between the last cervical and first dorsal vertebræ, and slight fracture of the latter at the anterior and upper margin of its body. All the ligaments between the two vertebræ at the seat of injury are ruptured, but not the membranes of the cord, which is crushed at the dislocated part for half an inch. The bones are healthy.

From a woman aged 37, who fell backwards down a flight of stairs when intoxicated. When first seen, about nine hours after the accident, she was conscious and still under the influence of drink; her lower extremities were quite insensitive and had lost all power of motion; though fully extended, she believed (to the last) that they were flexed. The next day, complete paralysis was found below the arms and shoulders; the upper extremities felt numb; but the patient could move her hands, without being able to grasp any thing. On the third day muttering delirium set-in: and death took place 71 hours after the accident.

Presented by J. Powdrell, Esq., 1870.

2025. Part of a spine, showing dislocation of the fifth from the sixth cervical vertebra. All the ligaments between the two bones are ruptured; and a portion of the periosteum with a small fragment of bone has been torn off the anterior and upper margin of the lower vertebra. The spinal marrow is completely torn across.

From a man aged 61, on whose neck a weight of 2 cwt. fell from a height of 20 feet. When admitted an hour later into Guy's Hospital he had motor paralysis of both legs and arms. Sensation was lost up to the nipples, and also on the ulnar side of the forearm; it was present on the radial side. The bladder and intercostal muscles were paralyzed; and there was priapism. At the end of four hours the temperature was 95°, the pulse 52; eight hours later the temperature was 98°·8, the pulse 64. Twenty-four hours after the accident the priapism had disappeared

and the temperature had risen to 108°·8 ; it fell, two hours later, to 102°. An hour later, twenty-seven hours after the accident, he died, being conscious and able to speak to the last.

Presented by Alfred Poland, Esq., 1871.

2026. The last four cervical vertebræ, with the corresponding part of the spinal cord exposed by the removal of portions of their arches. The right inferior articular process of the fifth cervical vertebra is dislocated forwards, a portion of the inferior part of its body is broken off, and the intervertebral fibro-cartilage beneath it is torn through. The spinal cord is compressed at the seat of injury.

2027. The last four cervical vertebræ of an adult. The fibro-cartilage between the fifth and sixth vertebræ is torn through, and the left superior articular process of the sixth is dislocated backwards, with fracture through the pedicle by which it was attached to the body.

Presented by Sir William Blizard.

2028. The last three dorsal and the first two lumbar vertebræ of an adult. The last dorsal vertebra has been fractured vertically through the middle of its body, and appears, besides, to have been crushed at its anterior part. The several portions are united by bone, but imperfectly. A considerable angular curvature is formed, in consequence of the loss of substance of the anterior part of the body of the vertebra, and the fractured posterior part projects far into the vertebral canal.

From the Museum of Robert Liston, Esq.

2028 A. A portion of a spine with a firmly united fracture in the lower part of the dorsal region. The fracture extends obliquely through a vertebra, commencing below and on the right side and passing upwards and to the left. The upper portion of the left half of the body of this vertebra has been completely separated, and is pressed outwards. The upper portion of the spinal column has been slightly displaced for-

wards, downwards, and to the right side. All the fractures are firmly united by bone. The cord has been constricted laterally by portions of the laminæ above and below the seat of the injury, owing to the rotation of the fragments in opposite directions. The cord below the constricted portion is much softened ; and the arachnoid cavity contains a thick layer of pus.

From a man aged 46, who sustained the injury in a fall from a height of 30 ft. Paralysis of sensation and motion was complete. He was suspended by the shoulders the day after the accident, and a plaster-of-Paris jacket was applied. This was removed in five weeks ; and he could then turn himself and sit up in bed ; but the paralysis was not improved. Death took place from exhaustion six weeks after the accident.

Presented by John Gay, Esq., 1882.

2029. The eleventh and twelfth dorsal and first lumbar vertebræ, in which certain changes have taken place in consequence of an injury received twenty-four years before the patient's death. The greater part of the body of the last dorsal vertebra has been absorbed; and, by the inclination of the anterior part of its lower surface upwards, the space between the spines of this and the vertebra next above is greatly increased. Complete osseous ankylosis has taken place between the articular processes of these two vertebræ on both sides ; and there has been a large formation of new bone around the heads of the twelfth pair of ribs.

From a man aged 28, who was admitted into the Naval Hospital at Plymouth, July 24, 1798, in consequence of an injury to the dorsal region of the spine, received in a fall into the hold of a ship. There were no external signs of the injury ; but he was completely paralyzed as to both sensation and motion below the middle of the body. The urine and fæces passed involuntarily and continually. After remaining in the hospital for eight years he was not able to do more than half raise the body so as to rest on one elbow. During the last three or four years of his life he complained of much pain in the loins. An attack of diarrhœa, about three months before his death, weakened him ; his general health, appetite, and strength gave way ; hiccough and vomitings came on, and, retaining his mental faculties to the last, he died on the 26th October 1822.

On examination of the body a large calculus was found in the

right kidney. The left was excavated by an abscess; and calculi were found lodged, one at the renal the other at the vesical end of the ureter. The upper one had almost ulcerated through the canal, to the outer surface of which the intestine had contracted a slight adhesion. The bladder was thickened, and had many pouches, which contained a considerable quantity of whitish chalk-like deposit from the urine.

Presented by Sir Stephen L. Hammick.

2030. The last two dorsal and the first four lumbar vertebræ of a man who fractured his spine nearly a year before death. The fracture seems to have implicated chiefly the first lumbar vertebra, the body of which is much reduced in size and covered at its anterior part with a layer of new bone, which extends over parts of the intervertebral cartilage above and below, and connects the remains of this vertebra with the bodies of those adjacent to it. Behind, a portion of the body of the first lumbar vertebra has been forced into the spinal canal, nearly separating the upper from the lower part of the spinal cord. The opposite internal surfaces of the dura mater are, at this part, in contact; its external surface is shreddy and covered with lymph.

The patient, an athletic man, 28 years old, received the injury from a fall of chalk and flints, which buried him several feet beneath their surface. He was speedily dug out; and an angle in the lumbar region of the spine, with complete paraplegia, was observed directly afterwards. He was unable to discharge his urine, with which, for some time after the accident, purulent matter was generally mingled: at the end of a month the integuments over the sacrum sloughed; but by changing his posture this evil was arrested, and the healing of the parts was complete in about four months. Six months after the accident the patient had regained the natural form and use of his spine, and complete control of the discharge of fæces and urine. His general health also was fully restored, and the paralysis of his lower extremities appeared to be the only remaining consequence of the injury he had sustained. But sloughing took place on the tuberosity of the ischium, apparently in consequence of his being in the habit "for some time of letting himself down stairs, step by step;" it was accompanied with partial necrosis of the tuberosity and the formation of a large abscess; and death ensued from the effects of this disease just ten days less than a year after the fracture of the spine.

A further account of the case is given by Mr. Harrold, in 'The

Medical and Physical Journal,' vol. xxv. p. 201, and vol. xxvi. p. 371 ; London, 1811.

Presented by Thomas Harrold, Esq.

2031. The last two dorsal and the first three lumbar vertebræ of an adult spine. The greater part of the body of the second lumbar vertebra appears to have been absorbed after being fractured, crushed, and to a slight extent dislocated laterally. New bone, accumulated about its margin, has united it with the body of the vertebra above it and with other portions of new bone thence proceeding. The posterior part of the remains of the fractured vertebra projects far into the spinal canal.

The patient, a collier, was thrown through several yards against the side of a mine, in an explosion of fire-damp. He was taken up insensible and severely scorched: the lower part of his back was bruised; but no sign of paralysis appeared till after four days, when he observed numbness and partial loss of power in the lower extremities. At the end of nine months, however, these ceased, and he resumed his employment, but in the next week was killed by a mass of coal falling on his chest.

Presented by J. L. White, Esq.

2032. The arches and spinous processes of seven of the lower dorsal vertebræ. A bullet, irregularly flattened, is fixed on the inner surface of the arch of the ninth dorsal vertebra. Some new bone is deposited around its place of attachment; and parts of the adjacent ribs are ankylosed to the transverse processes of the wounded vertebra and the vertebra above it.

"Thomas Cockcroft, 34 years old, a stout, healthy, and robust man, was, by mistake, wounded at Halifax (Yorkshire) with a pistol-ball on the left side of the spine, just below the scapula, on the morning of the 26th of July 1815. Immediately upon receiving the wound he fell to the ground; and when assisted to be raised up he declared that his back was broken. From that period until his death, which took place on the 11th of February 1827, he laboured under complete paralysis of the inferior extremities.

"From the time of receiving the accident he was principally confined to bed; his bowels were always confined, and his stools and urine came away involuntarily. He frequently complained of great pain in his right side and lower extremities, which he called 'bone-pain,' although totally insensible to their being

handled. At one time some bricks heated in boiling water were ordered to be applied to the soles of his feet, to keep up a natural warmth in the extremities; but his wife heated the bricks in an oven so effectually, that, after they had been applied to the feet a while, they were found firmly adhering to them, and the soles of both sloughed off: however, they got perfectly well.

"His appetite continued good until a few weeks before his death, when it began to fail, and he was seized with diarrhœa. About a month before his death he had a severe attack of erysipelatous inflammation in the right leg, from which he recovered; but, a fortnight before his death, a fresh attack of inflammation seized both thighs, and ended fatally.

"His body was not much emaciated: and nothing remarkable was found on examination of the thoracic and abdominal viscera, except that the spleen was enlarged and firm. The spinal cord, at the part on which the bullet pressed, was considerably diminished in size."

Presented by Dr. Moulson.

2033. Three lumbar vertebræ, from one of which (probably the third lumbar) a portion was broken off, including the spinous process, the arch and the two inferior articular processes—the plane of fracture having passed, on each side, through the junction of the arch with the superior articular and the transverse processes. The portion thus detached has dropped down a little; and its articular processes are freely movable upon the superior articular processes of the vertebra next below it, and upon two shallow fossæ which have been hollowed-out on the upper margin of the arch of that vertebra. A small quantity of new bone has been formed about the fractured parts; but in other respects all the vertebræ are healthy.

The person from whom the specimen was taken was a strong and well-proportioned man, about 50 years old; but his history was not known.

Presented by John Jessie, Esq.

2034. A sacrum, with the last two lumbar vertebræ. There has been a comminuted fracture of the sacrum. One chief line of fracture passes transversely across the junction of the first and second sacral vertebræ, and communicates with other fractures by which the upper angles of the first were broken off. The other chief line passes downwards

from the first sacral foramen on the left side, through the whole length of the body of the sacrum, and through the first portion of the coccyx. There has not been any process of union.

The patient, a lad 18 years old, fell from the top of Holyrood Palace, a height of 76 feet, and, in addition to the injuries exhibited in the preparation, received a compound dislocation of the ankle, with fracture of the astragalus, a dislocation of the humerus, and concussion of the brain. The only sign of the injury of the sacrum was severe pain in the back and loins. After death an abscess was found extending through the soft parts over the sacrum and last lumbar vertebræ, and communicating with another large collection of pus within the pelvis.

The case is recorded in the 'London Medical Gazette,' vol. v. p. 508, January 16th, 1830.

From the Museum of Robert Liston, Esq.

2035. A sacrum, with the coccyx and last lumbar vertebra. The lower end of the sacrum was fractured, and the coccyx dislocated to the right side, by a fall from a considerable height. Several of the fractured portions of the sacrum exfoliated ; and the part from which they were removed is smoothly healed. The first portion of the displaced coccyx is firmly fixed by bone in its new position, directly below the last sacral foramen on the right side.

The patient was 25 years old. Immediately after the fall he lost the use of his legs and the power over his bladder and rectum. Abscesses formed near the loins and the end of the sacrum ; and at various times portions of bone were discharged from them. He recovered for a time the power of controling the passage of his urine and fæces ; but his health declined, and he died with signs of inflammation of the spinal cord. Pus was found after death in the pia mater of the brain. The spinal cord was dark and soft, and its dura mater seemed disorganized. The sacral nerves appeared dark and diminished in size. All the lower part of the sacrum was deprived of its periosteum.

From the Museum of George Langstaff, Esq.

2035 A. The skeleton of a Beluga or White Whale which had sustained a severe injury to the neck some years before its capture. "The atlas has been dislocated off the occipital condyles to the left side and tilted a little obliquely, so that the right transverse process is somewhat higher than the

left. The dislocation has been complete, the whole of the surfaces formerly in apposition being now free from each other. The prominent inner edge of the left articular surface has passed beyond the outer edge of the condyle and lodged in the hollow which bounds it externally. In this position the bones have become firmly fixed by deposit of new osseous matter around the right side of the joint, and partially covering the exposed right condyle. The aperture for the passage of the spinal cord is narrowed to a chink scarcely three quarters of an inch in its greates transverse diameter. The articular surfaces, as far as they can be seen, have preserved their normal form, and are only slightly rougher than is natural, which clearly shows that the dislocation was traumatic, and not occasioned by disease of the joint." (See a description of the specimen by Professor Flower, Proceedings Zoological Society, November 18, 1879.)

Presented by His Grace the Duke of Sutherland, 1879.

Growths of Bone; Osteo-arthritis; Ankylosis.

2036. The second and four following cervical vertebræ of a feline animal, on the arches of which a large quantity of new bone has been formed. The new bone has grown chiefly on the left side, and on the upper vertebræ, in broad and long plates of light, porous, and brittle texture, like that on the scapula and humerus of, perhaps, the same animal in Nos. 1200 and 1201. These plates pass backwards by the sides of the spinous processes, overlapping the arches of the next following vertebræ. The plates from these several vertebræ have not coalesced, though they are placed closely one over the other; the movements of the vertebræ were therefore not prevented. *Hunterian.*

2037. Four cervical vertebræ. Ridges of bone have been formed on adjacent parts of the front and sides of their bodies and on some of the articular processes. These ridges are nodulated, like those formed round the articular borders of bones in chronic rheumatism. Those on adjacent vertebræ

are very near one another, but no union has taken place between them. *Hunterian.*

2038. Eight of the lower dorsal vertebræ of a Lion. New bone has been formed in ridges on the anterior surfaces and the upper and lower borders of their bodies. The ridges on the borders have grown with crenated edges towards each other over the intervertebral spaces and are nearly in contact, but they have in no instance coalesced. There are also irregular nodulated and hard osseous deposits on some of the articular processes. *Hunterian.*

2039. Two dorsal vertebræ of a Lion, which, by the further progress and coalition of growths of bone like those in the last-described specimen, are united by their adjacent anterior borders, and present deep coarsely nodulated ridges of bone, which overlapped the front of the vertebræ next above and below them. Similar ridges of nodulated bone are formed around the borders of the articular processes; and their articular surfaces, as well as those of the bodies, are in parts hardened, and in parts perforated by ulceration, in exactly the same manner as the Lion's ulnæ in Nos. 1919 and 1286, which are placed with the specimens of chronic rheumatic disease. *Hunterian.*

2040. A first lumbar and six lower dorsal vertebræ, from the anterior borders of which, both above and below, and chiefly in the middle line, flat and smooth processes of bone have grown-out, like sharp-edged ridges, and have met, but have not coalesced, in front of the intervertebral spaces. Continuous with these ridges new bone has been formed on the front surfaces of the bodies of the vertebræ, each of which is covered with a smooth hard layer of bone, nearly equal in width to the ridges which project from the adjacent borders. The spine is not distorted. *Hunterian.*

2041. Six lower dorsal vertebræ, the bodies of which are firmly united by the coalition of laminar growths of bone (like those last described) extending over one or both sides of

their borders and surfaces. The spine is not distorted, nor are the intervertebral spaces diminished in depth beneath the uniting growths of bone ; but the anterior and other parts of the margins of the bodies of the vertebræ which are not covered by the plates of bone are thickened and nodulated. *Hunterian.*

2042. Two cervical vertebræ, the bodies of which are united by the coalition of similar ridges of bone deposited on the adjacent parts of their anterior borders. Their other borders are thickened and nodulated. *Hunterian.*

2043. Vertical sections of two cervical vertebræ, similarly united. They show that the bond of union is confined to the exterior of the vertebræ, as if a bridge of new bone passed from the surface of one to that of the other over the intervertebral substance. All their own tissue is healty, except in that the other borders of their bodies and parts of the articular processes are nodulated. *Hunterian.*

2044. Five lower dorsal vertebræ, the bodies of three of which are firmly united by similar growths of bone over their surfaces and borders on the left side. There are similar growths on the other two vertebræ ; but they have not yet coalesced with those above and below them. The spine is slightly curved towards the right side, in consequence of the approximation of the left borders of the vertebræ. The borders of the left articular processes of the lowest two vertebræ are enlarged and nodulated ; and there are thin ridges of new bone on the upper margins of their arches. *Hunterian.*

2045. Four dorsal vertebræ, the bodies of which are similarly united. The chief growths of bone are on the left surfaces and borders of the vertebræ ; and there is a slight curvature towards the right side. There are also thin layers of fasciculated bone uniting the arches of the vertebræ, in the situation of the ligamenta subflava, like which ligaments also these plates of bone have large apertures in the middle line. *Hunterian.*

2046. Two lumbar vertebræ, similarly united by a broad thin plate of bone attached to the adjacent left borders of their bodies, and also by new bone formed between and smoothly uniting their spines, arches, and articular processes.

Hunterian.

2047. Four dorsal vertebræ, the bodies of which, on the right side, are united by a thin layer of bone formed upon their surfaces, and extending over the intervertebral spaces. Three ribs on the right side are immovably united to the spine by a continuation of this layer of new bone ; and on the left side two ribs are united by thin processes to the bodies of the adjacent vertebræ. The intervertebral spaces are narrow ; but there is no distortion of the spine.

Hunterian.

2048. The lower part of the spinal column of an aged woman, who had extensive osteo-arthritis of the right shoulder and knee-joints (see Nos. 1905, 1989). The surfaces of the bodies of the vertebræ present a ridged, fissured, and perforated appearance from a new formation of bone chiefly in vertical ridges ; the margins of the bodies are extremely irregular, and tipped by osseous outgrowths. The contiguous surfaces of the lumbar vertebræ are also roughened by formation of bone ; but there was no ankylosis.

Presented by J. Eric Erichsen, Esq., 1866.

2049. A vertebral column, with parts of the ribs. Nearly all the vertebræ have ridges of bone, in the form of plates and nodules, on their adjacent borders ; and many of these plates, growing towards each other, have united in front of the intervertebral substance. The seventh, eighth, and ninth dorsal vertebræ are thus united by a large flat and smooth plate of bone, which covers part of their anterior surfaces as well as their bodies, and has nearly united with similar growths on the bodies of the sixth and tenth dorsal vertebræ. The last cervical and first dorsal, the tenth and eleventh dorsal, and the second and third lumbar vertebræ are similarly united by separate large plates of bone. All these

plates are situated at the sides of the bodies of the vertebræ, some on the right side, some on the left. There is no distortion of the spine. Several of the lower ribs have been broken and re-united. *Hunterian.*

2050. A vertebral column and pelvis, with many of the ribs. By the extension of such disease as is shown in the preceding, all the vertebræ are united together, and all the ribs with them, by plates of bone extending over all their articulations. The ilia are, in the same manner, and with almost complete ossification of the sacro-iliac symphyses, united to the sacrum. So extensive and complete is this ossification, that the spine has the appearance, externally, of a nearly solid column of bone, with continuous branches extending outwards in the ribs. In only a few parts of the dorsal and lumbar regions there remain spaces in the position of the intervertebral ligaments ; and only in the upper cervical and lower lumbar regions are there any apertures where the ligamenta subflava were. The intervertebral foramina are of natural size. The spine has lost the natural anterior curves of the cervical and lumbar regions, but is not in other respects deformed. *Purchased*, 1847.

2051. Two lumbar vertebræ of a White Bear, united, like the preceding specimens from the human spine, by a broad thin plate of bone attached to the lower and lateral surfaces of their bodies and extending, like a bridge, across the intervertebral space. There is a small similar deposit on each of the transverse processes of one of the vertebræ.
Hunterian.

2052. Two lumbar vertebræ of a Horse, similarly united by a plate of bone attached to the adjacent surfaces of their bodies on the right side, and forming a considerable projection over the side of the intervertebral space.
Hunterian.

2053. Six dorsal vertebræ of a Horse. The bodies of five of them are united by new bone, which probably had its origin in growths like those already described, but now forms a con-

tinuous thick and smooth plate investing nearly the whole surfaces of all the bodies and covering-in the intervertebral spaces, so that the outlines of the several vertebræ can hardly be discerned. On the sixth vertebra similar deposits of new bone had taken place, but had not coalesced with those on the vertebræ above and below it; they serve to show that the growths are produced only on the surfaces of the bodies, and that the interior structure is unaffected by them. Similar and extensive formations of new bone have taken place on the arches and between the spinous processes of some of the adjacent vertebræ, uniting them immovably together. There is no distortion of the spine. *Hunterian.*

2054. A vertical section of five dorsal vertebræ of a Horse, the bodies and some of the arches and spinous processes of which are united in the same manner as those in the preceding specimen. The tissue of the new plate of bone has coalesced with parts only of the surfaces of the bodies, and not with the borders of them all; and it does not in any degree encroach upon the intervertebral spaces or implicate the internal structure of the vertebræ. *Hunterian.*

2055. Nine dorsal vertebræ of a Horse, of which, as in the two preceding specimens, the bodies are all united by plates of bone covering their borders and surfaces. Several of the spinous and articular processes are similarly united by plates and irregular masses of bone.

Presented by Sir William Blizard.

2056. All the cervical and the first four dorsal vertebræ of a Lion, similarly united by broad and very thick plates of bone, irregularly formed upon the sides and lower surfaces of their bodies. Many similar plates pass from the body of one vertebra to the transverse process of another, so that, viewed from below, scarcely any of the original structures of the spine can be discerned, but in their place an irregular, but nearly continuous, series of smooth plates and rounded masses of new bone. The upper part of the spine is a little drawn to the right side, on which the chief deposit of new bone has taken place. *Hunterian.*

2057. Three of the cervical vertebræ of an Ostrich, on several parts of which irregular plates and large masses of bone have been formed, as in the preceding specimens, and have united them immovably together. *Hunterian.*

2058. Two cervical vertebræ of the same bird, similarly diseased and united. *Hunterian.*

2059. Two of the lower cervical vertebræ of the same bird, similarly united by a large mass of new bone on the right side and under surface of the adjacent parts of their bodies. There are similar but smaller deposits on the arches and other parts of the vertebræ ; and their growth has produced some degree of distortion. *Hunterian.*

2060. A dorsal vertebra of the same bird, with the head of a rib which was fractured and united by bone. *Hunterian.*

Abscess ; Ulceration ; Caries ; Tuberculosis.

2061. A vertebral column, showing extensive disease of the intervertebral substances. Those in the lower lumbar and sacral region were, in the recent state, of the consistence of jelly, though now they are hardened by the action of spirit. Those in the dorsal region have disappeared, leaving wide spaces between the bodies without any intervening medium. In front of the bodies of the vertebræ is a ragged cavity, bounded anteriorly by strong fibrous tissue representing the anterior common ligament. This cavity is filled with thick caseous pus.

From a child aged 9. When four years old he fell off a chair, and a painful lump formed in the lower lumbar region. This subsided ; but a fistulous opening remained near the seventh right rib, which discharged slightly. The child rarely complained of pain, and could walk some yards unassisted. There was no paralysis of any kind. He died with symptoms of mesenteric disease. (For a full account of the case see Trans. Path. Soc. vol. xxiv. p. 177.)

Presented by Dr. Dowse, 1872.

2062. The eight lower dorsal and the three upper lumbar

vertebræ of a child, with the adjacent parts. Nearly the whole of the bodies of the last dorsal and first lumbar, with part of that of the eleventh dorsal vertebra, have been removed by ulceration ; and the approximation of the vertebræ above and below has produced a considerable angular curvature. All the other dorsal vertebræ are deprived of periosteum and superficially ulcerated. On the bodies of several of them, also, are small cup-shaped ulcerated cavities, with smooth well-defined margins ; and in these cavities, as well as within some of the vertebræ, are appearances of tuberculous matter. The intervertebral cartilages from the sixth to the eleventh dorsal inclusive are almost wholly destroyed. The spaces left by their removal between the bodies of the vertebræ contain only thin and loose lamellæ of their tissue, except at the posterior part, close by the vertebral canal, where, in some of the spaces, may be seen a portion of the intervertebral substance, of normal thickness, presenting anteriorly a sharp, abrupt, and smooth ulcerated edge, but, apparently, little altered in its texture. There are several small cavities in the thickened tissues about the sides of the vertebræ and the heads of the ribs, some of which are filled with tuberculous matter.

Presented by Sir William Blizard.

2062 A. A part of a spinal column extensively affected with caries, which implicates nearly all the dorsal and the two or three upper lumbar vertebræ. In the dorso-lumbar region is a sharp angular curvature, caused by the almost complete destruction of the bodies of five vertebræ, the remains of which are fused into an irregular spiculated mass. The bodies of the dorsal vertebræ above this part are extensively destroyed, and perforated in many places by rounded foramina opening into the spinal canal. The destructive process has extended most deeply into the centres of the bodies ; the normal concavity is therefore exaggerated, and the edges of adjoining vertebræ project as sharp ridges between the concavities. The right sides of the bodies are more extensively affected than the left.

From a person aged 26 years, who had suffered from a lumbar

abscess about two years. Death took place from bronchitis. There was no paralysis. A large abscess was found connected with the spine and occupying the posterior mediastinum and part of one side of the thorax.

Presented by John Gay, Esq., 1882.

2063. The last three dorsal and the first four lumbar vertebræ of an adult. The intervertebral fibro-cartilage between the first and second lumbar vertebræ has been removed by ulceration; and the adjacent parts of their bodies are ulcerated, and broken-up into portions which are nearly loose. New bone has been formed on the margins of the bodies of these two vertebræ, and in smaller quantity, and irregularly, on those adjacent to them. Ulceration has also taken place, to a small extent, on the anterior part of the body of the third lumbar vertebra. *From the Museum of Robert Liston, Esq.*

2064. Four lumbar vertebræ. The adjacent surfaces of the bodies of two of them present deeply ulcerated cavities; but their margins are unaffected, so that when viewed from the front they appear healthy, except for the small quantity of new bone deposited upon them. The ulcerated surfaces are formed of thickened cancellous tissue and a small quantity of new bone; and one of the cavities opens posteriorly into the spinal canal. The intervertebral substance has been removed from between these two vertebræ; but that between the others appears healthy.

From the Museum of Robert Liston, Esq.

2064 A. The five upper cervical vertebræ, with a portion of the occipital bone, affected at several points with carious ulceration. The right transverse process and both upper and lower articular surfaces of the same side of the atlas are entirely destroyed. The disease has also affected the corresponding condyle of the occipital bone and the articular surface of the axis, the right transverse process of the third vertebra, and the left occipito-atlantoid articulation.

"From the Very Rev. William Buckland, D.D., Dean of Westminster, who died August 14th, 1856, in his seventy-third year.

No other symptoms manifested themselves during life but those attributed to melancholia."

Presented by Francis T. Buckland, Esq.

2065. A vertical antero-posterior section of the lower dorsal and upper lumbar region of the vertebral column, exhibiting a deposit resembling tubercle, occupying the situation of the intervertebral substance between the last dorsal and first lumbar vertebræ, and encroaching upon the bodies of both. The deposit also produces a rounded elevation laterally.

Presented by — Dampier, Esq.

2066. A vertical section of the lumbar and part of the dorsal portion of a child's vertebral column, with the spinal cord. The bodies of the twelfth dorsal and first lumbar vertebræ, with their intervertebral cartilage, are wholly removed, and those of the eleventh dorsal and second lumbar are in great part removed by ulceration. The bodies of the other lumbar vertebræ appear to contain tuberculous matter in their cancellous spaces. The rest of the intervertebral cartilages and the other adjacent tissues are healthy. The parts above and below the ulcerated vertebræ coming together, a considerable angular curvature of the spine is produced; but, through the enlargement of the spaces between the arches of the vertebræ, the spinal canal is not diminished in its calibre. The spinal cord and the roots of the nerves appear healthy. *Hunterian.*

2067. Six lower dorsal and two upper lumbar vertebræ, with some of the adjacent parts. The whole of the body of the eleventh, and great parts of those of the tenth and twelfth dorsal vertebræ, have been destroyed by ulceration; and the remains of the two latter coming together, a considerable angular curvature has been produced. The bodies of all the other vertebræ are superficially ulcerated; the last dorsal intervertebral substance is destroyed; and the remains of the periosteum and other tissues in front of the spine are thickened and separated, as if pus had been collected beneath them. The portion of the aorta which is preserved appears to have been bent. *Presented by Sir William Blizard.*

2068. The bodies of two lumbar vertebræ, showing tubercular deposits in their centres and destruction of the surrounding bone. *Presented by John Hilton, Esq.*, 1867.

2069. Nine lower dorsal and two upper lumbar vertebræ, with the surrounding parts. The bodies of the tenth and eleventh dorsal vertebræ have been, in great part, destroyed by ulceration, and the spinal canal is exposed from the front. A large abscess, which formed in front and by the sides of the column, appears to have been confined by the thickened periosteum and other tissues, and to have extended beneath them up to the third dorsal vertebra and down to the second lumbar. The bodies of all the vertebræ included in this extent are superficially ulcerated, except that of the ninth dorsal, which (like the remains of the bodies of the tenth and eleventh) is covered with a dense tissue of new formation, like tough false membrane. Parts of the last dorsal and first lumbar vertebræ are similarly covered. No curvature of the spine appears to have existed.

2070. A vertical section of the dorsal and lumbar regions of the vertebral column. The bodies of the five lower dorsal and the first lumbar vertebræ are affected by ulceration, which has attacked the anterior part of the bodies and destroyed the twelfth dorsal to such an extent that the first lumbar and eleventh dorsal almost touch each other anteriorly, causing much angular curvature. The remainder of the body of the twelfth dorsal vertebra presses on the cord, which appears otherwise healthy, as room is made for it posteriorly by the separation of the arches. Four of the intervertebral cartilages in the diseased region are almost entirely removed.

From a man aged 41. Three years before his death he was affected with pain in the lumbar region and numbness in the legs. The numbness passed away; and the functions of the cord continued unimpaired till his death, which took place in consequence of the exhaustion produced by free discharge from a lumbar abscess and uncontrollable vomiting.

Presented by John Hilton, Esq., 1866.

2071. The middle of the dorsal portion of a vertebral column, with the spinal cord and other adjacent parts. A cavity has been formed in the substance of the bodies of three of the vertebræ, one of which is almost entirely removed. The interior of this cavity is smooth and distinctly circumscribed; it contained pus, and had not any external aperture, its walls, where the bone was destroyed, being formed of the thickened and indurated tissues in front of the column. By the approximation of the remains of the bodies of the diseased vertebræ the spine is curved so as to form nearly a right angle. But the vertebral canal is not diminished in size opposite the apex of the angle, nor is the spinal cord compressed; for the spaces between the arches of the vertebræ are increased; and there is a thick layer of adipose tissue on each surface of the cord where it is most bent.

The patient was a young woman. The angular curvature of the spine had existed two years, without impairment of the nervous functions, when she died with disease in the chest and abdomen.

From the Museum of Robert Liston, Esq.

2072. The last four dorsal and the first four lumbar vertebræ of a middle-aged man. The borders of the last dorsal and first lumbar vertebræ are almost entirely destroyed by ulceration. The remaining portions of them have the aspect of healthy cancellous tissue, and are approximated so that there is a considerable angular curvature of the spine. The bodies of the vertebræ next above and below them are superficially ulcerated and covered with a small quantity of new bone. The arches and processes of all the vertebræ are healthy; but the whole tissue of the spine is light and dry.

From the Museum of Robert Liston, Esq.

2073. The six lower dorsal and the two upper lumbar vertebræ of a child. After the destruction, by ulceration, of the greater parts of the bodies of the three lower dorsal and the first lumbar vertebræ, their remains were approximated, and are completely and firmly united in one mass of rather hard bone, in which a part of one of the intervertebral substances is imbedded. There is a very acute angular curva-

ture opposite the seat of the disease; but the spinal canal, though somewhat shortened, is increased in diameter.

From the Museum of George Langstaff, Esq.

2074. The last two lumbar vertebræ and the sacrum of a man forty-five years old. The body of the last lumbar vertebra has been almost entirely destroyed by ulceration; its remains are fixed to the vertebra above it and to the sacrum by bridges of new bone attached to their several borders. The intervertebral substance appears healthy. The upper half of the sacrum is in many parts superficially ulcerated; and its lower half is so deeply and extensively ulcerated that, in maceration, it has fallen into small irregular portions.

The chief signs of the disease were severe pain in the legs and lower part of the back. At last the patient had diarrhœa, and died with extensive ulceration of the large intestines.

From the Museum of Robert Liston, Esq.

2075. The two lower dorsal and all the lumbar vertebræ of a young person. Their tissue is very light, dry, and spongy; and there are scarcely any remains of the compact layer which should cover their surfaces. The greater part of the left side of the arch, spinous process, and inferior articular process of the second lumbar vertebra has been destroyed by ulceration; and there are such deposits of new bone on the sides of the bodies of the adjacent vertebræ as make it probable that there was a lumbar abscess. *Hunterian.*

2076. Three lumbar vertebræ, the bodies of which have been irregularly ulcerated and are covered and united by deposits of new bone. The surfaces of the ulcerated parts are smoothly rounded, formed of healthy cancellous bone, and, in general characters, are like those of tuberculous cavities in bone. *Hunterian.*

2077. Three lumbar vertebræ and a sacrum. The anterior parts of the bodies of the two lower vertebræ have been superficially ulcerated; and new bone is formed upon them around the ulcerated surface. *Hunterian.*

2078. A similar specimen. *Hunterian.*

2079. The last two lumbar vertebræ and the sacrum of a young person. A large portion of the upper and left part of the sacrum has been destroyed by ulceration. *Hunterian.*

2080. Four lumbar vertebræ with the pelvis of a child. The body of the last lumbar vertebra is almost entirely destroyed by ulceration ; those of the third and fourth are very deeply ulcerated ; and there has been superficial ulceration of the whole of the front of the sacrum. There is no disease of the ilia or of the sacro-iliac articulations.

It is probable that in this case there was a lumbar abscess, which passed down behind the rectum.

Hunterian.

2081. Two lumbar vertebræ, united by growths of bone between and around their bodies. The anterior part of the body of one has been superficially, that of the other deeply, ulcerated ; but the appearance both of those parts and of the new bone, the surface of which is hard and smooth, indicates that the ulceration was not in progress. *Hunterian.*

2081 A. Part of the spine of a cartilaginous fish, probably a large Ray. It has been bent, in consequence of one of the vertebræ having lost a great part of its internal structure and its two surfaces being on one side closely approximated. New bone has been formed in small quantity on the bodies of the diseased and the adjacent vertebræ. *Hunterian.*

Necrosis.

2082. The four lower lumbar vertebræ, with parts of a sacrum and of a left ilium. Small portions of the body of the third lumbar vertebra were separated, and lay loose in a cavity between it and the upper part of the fourth. A portion of considerable size, in a state of necrosis, is enclosed within this cavity, attached to the remainder of the body by only a small part of its surface. There are small superficial

ulcerations on the anterior part of the body of the fourth vertebra, and on the side of the fifth, as well as on the upper part of the sacrum, and on the internal surface of the crest of the ilium. New bone has been deposited on various parts of the diseased vertebræ.

The patient had a lumbar abscess which pointed in the left groin and above the crest of the left ilium.

From the Museum of Robert Liston, Esq.

2083. The last two lumbar vertebræ. The greater part of the cancellous tissue of the upper one has suffered necrosis: portions of dead bone came away in the discharge of psoas abscess; but others are still seen, partially separated from the surrounding healthy tissue. New bone has been formed upon the anterior and lateral surfaces of the bodies of both vertebræ, on the right side in sufficient quantity to form a bridge connecting them.

Presented by Sir Stephen L. Hammick.

Union by Bone; Osseous Ankylosis.

2084. Part of the base of a skull, with the atlas, which is in several places united to it by bone. A part of the left side of the arch of the atlas is deficient, probably from ulceration. *Hunterian.*

2085. A mutilated skull of a European, showing complete bony ankylosis between the lateral portions and anterior arch of the atlas and the occipital bone.

From the Barnard Davis Collection.

2086. A second and a third cervical vertebra, the corresponding articular processes of which, on the left side, are united by bone. There is also some formation of new bone around the borders of the same processes on the right side. Their bodies are not displaced or diseased. *Hunterian.*

2087. A second and a third cervical vertebra. Their bodies, laminæ, articular and spinous processes are firmly united

by bony ankylosis. A vertical section has been made across the bodies to show the state of the intervertebral disk. Its position is marked by a fissure in the middle of the section, across which lies a small plate of bone, apparently the disk ossified. *Donor unknown.*

2088. A second and a third cervical vertebra, of which all the adjacent parts are smoothly united by bone, without displacement. *Hunterian.*

2089. Vertical sections of a second and a third cervical vertebra, the bodies of which are united by a continuity of bone over a great part of their circumference, so that the centre only of the intervertebral space remains. The arches are similarly united; the right side of that of the third vertebra is nearly deficient. *Hunterian.*

2090. Vertical sections of the fourth and fifth cervical vertebræ of, probably, the same spine as that from which the last described were taken. The posterior halves of their bodies are similarly united by cancellous bone. Their anterior margins, also, are in part united. *Hunterian.*

2091. A sacrum and last lumbar vertebra. The left transverse process of the vertebra and the upper part of the ala of the sacrum are closely and smoothly united by bone, without distortion. *Hunterian.*

2092. A similar specimen, except that the union has taken place on both sides and is rather less complete. *Hunterian.*

Dislocation after Disease.

2093. A part of the occipital bone, with the first three cervical vertebræ, of a child twelve years old.

From the Museum of George Langstaff, Esq.

The following account of the case is recorded by Mr. Lawrence

in his observations "On Dislocations of the Vertebræ," in the 'Medico-Chirurgical Transactions,' vol. xiii. p. 400, London, 1825.

"At the age of five or seven, a child became the subject of an illness supposed to be hydrocephalus. After it had existed for some time, a swelling took place in the side of the neck, obviously containing fluid; and this slowly increased to a considerable magnitude, so that its contents must have amounted to several ounces. Pressure on this swelling affected the brain, producing a state of coma. It was supposed at this time that the fluid in the neck communicated with that suspected to exist in the ventricles of the brain. The child used to move the head cautiously and slowly, supporting it with the hands at the sides. After a long continuance the symptoms slowly subsided, and at last entirely disappeared, together with the swelling of the neck. At no period of the complaint was there any interruption or diminution of sensation or voluntary motion; and the recovery of health and activity was complete, the child being able to walk or run, and engage in the active sports suited to its age. There was nothing to attract particular notice in the position of the head. After some time had elapsed, disease came on in the lumbar vertebræ, attended with bending forwards of the spine and the formation of a large lumbar abscess. In consequence of this affection the child died at the age of twelve.

"*Examination.*

"The head was examined during the hottest part of last summer; and the brain had become so soft that the changes produced in it by disease could not be ascertained. Mr. Wigan brought to me the basis of the skull, in which we were surprised at observing a considerable bony prominence standing up in the right side and front of the foramen magnum.

"The projection in question was smoothly covered by the dura mater; and it was soon apparent that it must be the dentiform process of the second vertebra. When the soft parts had been completely removed by maceration, I found an extensive displacement of the occiput, atlas, and axis, and a firm consolidation of these bones in their new relative positions by the complete bony anchylosis of several articulations. The atlas is partially dislocated towards the left, and at the same time thrown a little forwards and upwards: hence the right and posterior part of its bony ring intercepts a considerable portion of the spinal canal. The middle anterior protuberance now corresponds to the left side of the basilar process; the extremity of the left transverse process projects three quarters of an inch beyond those of the two following vertebræ, while the right transverse processes of those vertebræ project one quarter of an inch beyond the corresponding one of the atlas. A considerable part of the right side of this bone has been destroyed by absorption—that is, the surfaces by which it is articulated to the occiput and axis, a part of the transverse process, and that groove on which the right vertebral artery rested. The axis is completely dislocated from the atlas and occiput to the

right, so that its left portion intercepts about one third of the spinal canal: and the dentiform process projects by its whole length into the cavity of the skull at the anterior part of the foramen magnum, close to the right anterior condyloid foramen.

"In the natural position of the parts, the apex of this process is a little below the level of the occipito-atlantal articulation: here it is an inch above the same level, while its projection into the cavity of the skull is between five and six eighths of an inch. The lateral displacement is no less extensive, the measurement from the left anterior condyloid foramen to the middle of the basis of the dentiform process being seven eighths of an inch, while the distance from the right foramen to the same point is only two eighths. We cannot but be astonished at finding that the immediate pressure of this bony projection on the under surface of the medulla oblongata caused no paralytic affection, even when we allow for the very gradual manner in which it must have taken place. The course of the right lingual nerve and vertebral artery must have been greatly altered.

"The bodies of the second and third vertebræ are displaced towards the right, so that a line drawn along their middle and continued upwards would strike the right margin of the basilary process; and the small tubercle on the anterior arch of the atlas corresponds to the left side of those bodies.

"The right occipital condyle, the remains of the right transverse process of the atlas, the inferior articular plane of the axis, and the right side of the basis of the dentiform process are anchylosed, so as to form one solid bony mass.

"The left occipital condyle is partially anchylosed with the atlas; the left articular plane of the axis, its transverse process, and that of the third vertebra are all consolidated with the partial anchylosis just mentioned. The articular processes of the axis and the third vertebra are anchylosed, the union extending on the left side as far as the bases of the spinous processes. The bodies of the axis and third vertebra are not anchylosed.

"The preternatural bony connections just enumerated are perfect, equalling in solidity the natural bony structure, so that the limits of the anchylosed bones are confounded. The bony texture is quite natural; there is no roughness of surface, no diminution of solidity, nor any appearance of caries.

"The dimensions of the vertebral canal at its commencement are greatly reduced by the extensive displacement of the atlas and axis. The antero-posterior diameter of the foramen magnum is in this case one inch and a half, the greatest measurement from side to side is one inch and a quarter. The diameter of the ring of the third vertebra, from side to side, is seven eighths of an inch, from front to back six eighths. The measurement of the canal, between the displaced portions of the atlas and axis, is half an inch from before backwards, and five eighths of an inch from side to side.

"The history and examination of this case clearly show that the opinion originally entertained of its being hydrocephalus was

altogether erroneous, that the primary disease was an affection of the articulations, the fluctuating tumour in the neck being a chronic abscess consequent on that affection, while the spontaneous disappearance of the tumour is referable to the cessation of the irritation which caused it. The swelling bore the same relation to the vertebral disease that lumbar abscess does to disease in the lumbar region of the spine."

2094. An atlas and axis. Owing to disease in the atlanto-axial joints, the atlas has been dislocated forwards and at the same time slightly rotated forwards on the left side. This displacement, involving the approximation of the posterior arch of the atlas to the odontoid process, has considerably diminished the calibre of the vertebral canal. The odontoid process and the part of the anterior arch with which it articulates are roughened by small deposits of new bone.

From an unhealthy lad aged 16, who had long suffered with mitral and aortic valvular disease. When admitted, shortly before his death, into the Highgate Infirmary, his head appeared constantly bent forwards, with great stiffness of the neck and slight loss of power in the extremities. He died with pulmonary apoplexy.

Presented by W. E. Hacon, Esq., 1878.

2095. A cast of a portion of an occipital bone with the atlas and axis, showing an old, unreduced dislocation of the atlas forwards, like that in the preceding specimen. The displaced bones appear to have been firmly united by osseous tissue.

The original specimen is figured in Malgaigne's 'Traité des Fractures et des Luxations,' and is mentioned as a pathological dislocation without any history.

Presented by Professor Gervais, 1877.

Lateral Curvature.

2096. An adult vertebral column, in the superior dorsal portion of which there is a slight lateral curvature, the convexity of which is to the left. A slight compensating curve, bringing the top of the sacrum into the same median vertical plane as the upper cervical vertebræ, extends from the middle of the dorsal region to the third lumbar vertebra. The bodies of the vertebræ and the intervertebral substances are

reduced in depth on the side next the concavity of each curve; and the articular processes on the same side are turned a little forwards by the rotation or torsion of the vertebræ; but their tissues appear healthy. *Hunterian.*

2097. An adult vertebral column, in the middle dorsal portion of which there is a more considerable curvature to the right. Both the lumbar and the superior dorsal portions are, in compensation, slightly curved to the left. The bodies of the vertebræ are somewhat rotated; the left articular processes of those affected by the chief dorsal curve are turned forwards, and the left articular processes of the lumbar and superior dorsal vertebræ backwards; so that, in both cases, that side of the vertebra which lies in the concavity of the curve is turned forwards. The grooves by the sides of the spinous processes are all narrower on the right than on the left side. Many of the vertebræ are slightly thickened and nodulated at the margins of their bodies and articular processes; and the *grain* of the texture of the bodies of those which are engaged in the chief curvature is oblique in the direction of, and in adaptation to, the curve.

Hunterian.

2098. A natural skeleton of the trunk of an adult female. The dorsal portion of the spine is much curved, with its convexity directed to the right, and with slight rotation of the bodies of the vertebræ, their left articular processes being turned forwards. A curve exists in the opposite direction in the lumbar portion of the spine. The bodies of the vertebræ and the intervertebral spaces are reduced in depth, and their margins are very prominent on the side directed to the concavity of each curve; but their texture does not appear altered. The spinous processes of the vertebræ engaged in the upper curve (that to the right) are directed rather to the left, those of the vertebræ in the lower or leftward curve to the right; and in both cases the spaces between the spinous and transverse processes of the vertebræ are narrower on the convexity than in the concavity of the curves. The ribs are all approximated; the angles of those

of the right side, towards which the dorsal part of the spine is curved, are less obtuse than is natural; and this side of the chest is much contracted. But on the left side the angles of the ribs are unusually obtuse; and the capacity of this side of the chest is enlarged, at least in its lateral dimensions, nearly enough to compensate for the contraction of the other side. The pelvis is healthy. *Hunterian.*

2099. An adult vertebral column, with a sudden curvature directed to the right in the inferior dorsal region, but with scarcely any curvature in the opposite direction in the parts above and below. The curve includes the fourth dorsal, second lumbar, and all the intervening vertebræ; their bodies are reduced in depth on the left side, and rotated so that their left articular processes are turned almost straight forwards. The angles of the right ribs, and especially of those that are attached to the vertebræ in the middle of the convexity of the curve, are much less obtuse than usual; their shafts also are directed very obliquely downwards, and some of them are within half an inch of the vertebræ. The angles of the left ribs, especially of those connected with the vertebræ in the middle of the concavity of the curve, are very obtuse, and almost obliterated; and their shafts are directed nearly horizontally outwards, enlarging this side of the chest in compensation for the contraction of its right side.

2100. An adult vertebral column, with the bones of the chest. There is a slight curvature to the right, extending from the sixth dorsal to the third lumbar vertebra, and very slight curvatures in the opposite direction in the parts above and below. Plates or ridges of new bone have been formed on the borders of the bodies of the lower dorsal and the lumbar vertebræ, and have thus united some of them. The chief growths of new bone are on those sides of the bodies which lie in the concavities of the curves.

2101. Four lumbar vertebræ, of which the corresponding articular processes on the right side are united, with a con-

siderable accumulation of bone upon them and the adjacent parts. The arches, and two of the articular processes on the left side, are similarly united. The spine is much curved, with its concavity turned to the right side, but with little or no twisting of the bodies of the vertebræ.

Hunterian.

2102. Three dorsal vertebræ, the articular processes and arches of which are united on the right side, like those in the last specimen. There is also a similar curvature of this part of the spine without twisting. *Hunterian.*

2103. The last cervical and eleven of the dorsal vertebræ of a very distorted spine. The chief distortion is in the six lower dorsal vertebræ, which form a curve, the convexity of which is directed backwards and to the right side. Those surfaces of their bodies which were turned forwards are now turned straight outwards to the right ; their spinous processes are turned, but in a less degree, to the same side ; and the left (which are now the anterior) sides of the bodies of the vertebræ are so diminished in depth that in the concavity of the curve the distance between the lower borders of the sixth and eleventh dorsal vertebræ is hardly more than an inch. The articular surfaces and the arches of nearly all these lower dorsal vertebræ are immovably united by bone ; and so are the left sides of their bodies. The five upper dorsal and the seventh cervical vertebræ are less diseased : they present a curvature, of which the concavity is turned towards the right, but their bodies are scarcely at all rotated. The spinous and articular processes and the left side of the bodies of the fourth and fifth dorsal vertebræ are united by bone. A part of the seventh rib on the right side is preserved ; its head and neck are smoothly united by bone to the articular processes and bodies of the two adjacent vertebræ ; and its shaft, as far as the angle, lies parallel with the side of the spine. The articular surfaces for the ribs of the left side are enlarged, especially those which are in the concavity of the inferior and chief curvature. *Hunterian.*

2104. Seven vertebræ, from the dorsal portion of a spine in which there is a very acute lateral curvature. The spaces between the vertebræ are, on the convex side of the curve, increased in depth ; of those on the concave side, three are much diminished in depth, and the others are nearly obliterated, the half-borders of the adjoining vertebræ having coalesced with a smooth band of new bone formed on them. The bodies of all the vertebræ are thinner and rather more compact on the concave than on the convex side of the curve, but they are not otherwise altered. The articular processes and most of the laminæ on the concave side are united by bone ; and so are some of those on the convex side ; but their texture, as well as that of the spinous processes, appears healthy. It may be observed that in this, as in many of the preceding cases, all the large blood-vessels which enter or leave the bodies of the vertebræ do so in the concavity of the curve. *Presented by Sir William Blizard.*

2105. Part of a spine with a lateral curvature extending through the whole dorsal region. The aorta is curved and tortuous in exact adaptation to the bodies of the vertebræ.

2105 A. The lower part of a spinal column with a lateral curvature in the lumbar region, the convexity of which is on the left side. The bodies of the vertebræ implicated in the curvature are extremely rotated towards the left. The column is divided vertically. The section shows that the intervertebral substances and the bodies of the vertebræ are diminished in thickness at the concavity of the curve ; and the margins of the vertebræ are here prolonged into a lip-like projection.

From the late Dr. Gideon Mantell.

Presented by William Adams, Esq., 1881.

2106. The posterior lumbar and the caudal vertebræ of a Porpoise. There is a double lateral curvature, and some of the bodies of the vertebræ have small deposits of new bone at the edges of their articular surfaces.

From an adult female, taken at Brighton in the spring of 1870.

It was sent to the Zoological Gardens, where it lived only a few days. The curvature is probably the result of injury inflicted when the animal was young, as small shot is lodged in the spines of two of the vertebræ, and above one of these shot is a hole made by a third.

Presented by Mr. E. Gerrard, Jun., 1870.

Posterior Curvature.

2107. The vertebral column and pelvis of an aged woman. From the second cervical vertebra to the top of the sacrum the spine forms a single curve, the whole of which is more concave anteriorly than the natural dorsal curve usually is (spondylitis deformans). When the pelvis is held in the position which it occupies in the erect posture of the healthy body, the second cervical vertebra of this spine is eight inches in front of the symphysis pubis. New bone has been formed upon the borders of the bodies of nearly all the dorsal and lumbar vertebræ ; and some of them are united by the new bone thus formed coalescing in front of the intervertebral spaces. The pelvis is healthy, and of natural dimensions.

From the Museum of Robert Liston, Esq.

2108. The dorsal, with parts of the lumbar and cervical, portions of a spine, which is considerably curved backwards, and in the upper dorsal portion is turned slightly to the right side. The left sides of the vertebræ are shallower than the right. Nearly all the dorsal intervertebral spaces are obliterated or extremely narrow, and parts of the bodies of the five upper dorsal vertebræ have a continuous smooth surface.

These changes probably occurred in old age.

Hunterian.

2109. A vertebral column from the sixth cervical vertebra downwards, with the ribs and pelvis. All the bones are firmly united together by growths of new bone passing between and around their articular surfaces, and occupying the place of the ligaments. The spaces between the bodies of the vertebræ which were occupied by the intervertebral substance remain, though enclosed on all sides by new bone.

The ribs are united to the vertebræ both at their heads and tuberosities. The sacro-iliac synchondrosis and the pubic symphysis are completely osseous. New bone, in the shapes of rough tubercles and spines, is formed on the ends of all the spinous processes of the vertebræ, in many instances passing bridge-like from one to the other, and on the sides of the lumbar vertebræ, upon the crest of the ilium, and about the symphysis and ramus of the pubis, and the ramus and tuberosity of the ischium. There is a slight lateral curvature in the spine.

Found in a vault beneath the church of St. Martin in the Fields, not far from the coffin of John Hunter.

Presented by Frank T. Buckland, Esq., 1862.

Angular Curvature.

2110. Vertical sections of the natural skeleton of the trunk of a child. The bodies of the sixth and seventh dorsal vertebræ are wholly, and those of the fourth, fifth, and eighth are partially, destroyed by ulceration. The adjacent ribs were all separated from their connections, and some degree of angular curvature had been produced by the approximation of the parts of the spine above and below the seat of disease, when the child died. *Hunterian.*

2111. The bones of the trunk of a child, with angular curvature of the lower part of the dorsal region of the spine, occasioned by caries of the bodies of the vertebræ. The consecutive curvature of the ribs and deepening of the thorax is well shown. *Presented by Gilbert W. Mackmurdo, Esq.*, 1867.

2112. A natural skeleton of the trunk of a person about eighteen years old, divided by a vertical section through the spine and sternum. After almost complete destruction by ulceration of the bodies of the last five dorsal and the first lumbar vertebræ, the remaining parts have come together and united in one mass of apparently healthy cancellous tissue. There is a very acute angular curve, and a slight lateral

distortion, in this region; but the spinal canal is not narrowed. The ribs are approximated, many of the intercostal spaces being only a quarter of an inch wide; the obtuseness of the angles of the ribs is diminished; and the sides of the chest are flattened, the shafts of the ribs being directed nearly straight forwards: the lower ribs are nearly in contact with the crests of the ilia. *Hunterian.*

2113. The injected and dried heart and large blood-vessels of the person whose spine was last described. The aorta is twice bent into acute angles, in correspondence with the deformity of the spine; the vena cava inferior is more gently curved. Both of them are of natural diameter. *Hunterian.*

2114. A natural skeleton of the trunk of an adult male. After nearly complete destruction by ulceration of the bodies of the sixth, seventh, and eighth dorsal vertebræ, and partial destruction of those of the fifth and ninth, the remains of the latter two have come together and firmly united. But they have united side by side; so that, together with a very acute angular curvature, there is a lateral displacement in the middle of the dorsal region, and, in compensation for this, a gentle lateral curvature in the inferior dorsal and lumbar portions. The ribs are approximated, and appear of unusual length; they are all directed very obliquely downwards and forwards, in lines nearly parallel with the lower part of the spine; and their extremities reach below the crests of the ilia. The pelvis is healthy, and of natural dimensions; the tissue of its bones and the development of the parts for the attachment of muscles are such as indicate that there was no long-continued paralysis of the lower extremities, although the distortion of the spine must have existed for a considerable time. *Presented by —— Blood, Esq.*

2115. A portion of a spinal column, including the two lower cervical and eleven dorsal vertebræ, with an acute angular curvature in the middle dorsal region. The body of the fifth dorsal vertebra has been completely, and those of the fourth and sixth vertebræ in great part, destroyed by caries.

The remains of the bodies and the laminæ are firmly ankylosed.

"From a gentleman who had a fall when hunting. Inflammation and caries * * * followed, and paralysis which lasted two years. But recovery was so complete that he lived for twelve years afterwards, married and had a child, rode, danced, and shot; he died finally of Bright's disease."

Presented by T. Spencer Wells, Esq., 1866.

Specimens of Injuries and Diseases of Vertebræ in other parts of the Museum are:—Nos. 31, 103, 1205, 1206, 1606, 1663, and 1683.



Subseries A.

Distortion of the Pelvis.

2116. The lower part of a spine, with the pelvis and the upper portions of the thigh-bones. The spine has a considerable curve towards the left side. The pelvis is distorted, and all its bones are small and light ; its diameter, from the promontory of the sacrum to the symphysis pubis, is only two inches and a quarter ; from the coccyx to the same symphysis, two inches and a half ; its greatest transverse diameter is five inches and two thirds ; its greatest oblique diameter four inches and a half. The head and neck of the left femur have been destroyed by ulceration ; the left acetabulum is filled up with ligamentous tissue ; and what remains of the shaft of the left femur indicates that it was long fixed in a position of extreme flexion and adduction. The same posture is indicated by an accumulation of bone on the body of the os pubis, over which the femur rested. The right femur appears to have been similarly fixed ; but the state of the right hip-joint cannot be discerned.

2117. A female pelvis, with slight asymmetrical distortion apparently from rickets, with perhaps lateral curvature of the spine. The pelvis is flattened antero-posteriorly by the projection forwards of the sacral promontory ; the antero-posterior diameter of the "inlet" is two and a half inches. The lower end of the sacrum is sharply bent forwards. The necks of the femora form a right angle with their shafts, which present a slight anterior curvature.

Purchased, 1868.

2118. A pelvis, distorted chiefly in consequence of atrophy or arrest of development of the right innominate bone. The antero-posterior diameter of the brim is 3 inches ; the other diameters of the "inlet" are normal ; but those of the "outlet" are narrowed. The osseous tissue was rendered so friable by fatty degeneration that portions of the sacrum between the foramina have crumbled away. A fracture which runs along parallel to the crest of the right ilium may

also be presumed to be accidental; the ilium is here extremely thin and brittle.

From an old woman, a dissection-subject, 1867.

2119. A female pelvis, presenting in a marked degree the distortion characteristic of mollities ossium. The cavity of the brim is heart-shaped and almost horizontal. The promontory of the sacrum and the lower lumbar vertebræ have been pressed forwards, and the sides of the pelvis have been projected inwards by the weight transmitted through the spine to the femora. The rami of the ossa pubis and ischia are bent sharply forwards and closely approximated. The lower end of the sacrum is similarly curved forwards.

From a woman aged 37, on whom Cæsarian section was performed. She had had previously two abortions. Her spine was exceedingly distorted; "a wooden ball one and five sixteenths of an inch in diameter would only just pass through the pelvis." (The specimen is described and figured in Mr. W. Adams's 'Lectures on Curvature of the Spine,' p. 141, London, 1865).

Presented by T. Carr Jackson, Esq., 1868.

Specimens of Distortion of the Pelvis in other parts of the Museum are:—Nos. 677 to 679, 709, 3881, 3882.



PRINTED BY TAYLOR AND FRANCIS.
RED LION COURT, FLEET STREET.